THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LVII. No. 1447.] LONDON, FEBRUARY 3, 1891. [43RD YEAR. Price 6d.

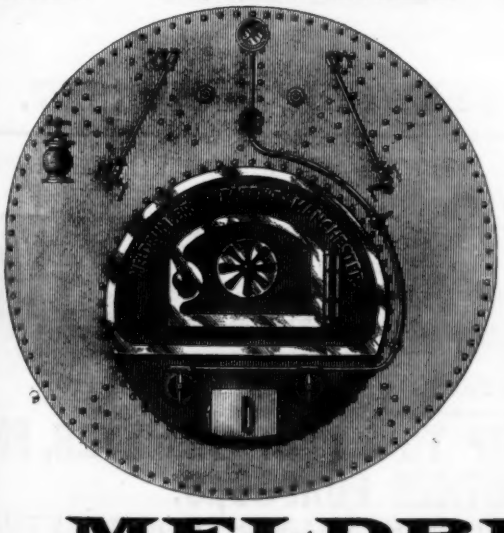
WOLSTON'S Paste and Ready Mixed for Use.
Guaranteed Free from Adulteration. **TORBAY PAINTS.**
FOR GASHOLDERS, &c., &c.
The Original "Torbay Paints" As supplied during the present and many preceding years to the LONDON GASLIGHT & COKE COMPANY.
Special Quotations to Gas Companies.
TORBAY & DART PAINT Co., Ld.,
23, Gt. George St., Westminster, S.W.
Works: DARTMOUTH, DEVON.

— ESTABLISHED 1830. —
PARKER & LESTER,
Manufacturers & Contractors.
THE ONLY MAKERS OF
PATENT ANTIMONY PAINT,
Parker's Imperial Black Varnish,
Oxide Paints, Oils, and General Stores for Gas and Water Works.
WORKS:
ORMSIDE STREET, OLD KENT ROAD, LONDON.
Ashmore, Benson, Pease, & Co., Ld.,
STOCKTON-ON-TEES,
Manufacturing Gas Engineers.
See Advertisement, p. 226.

CEMENT
EARLE'S
BEST
Portland Cement
MANUFACTURED BY
GEO. & THOS. EARLE,
HULL.
Office: 7, PIER STREET.
Works: WILMINGTON.
STOREAGE CAPACITY 10,000 Tons.
ESTABLISHED 1811—OVER THREE QUARTERS OF A CENTURY.
Telegraphic Address: "CEMENT HULL."

J. UNGAR & CO.,
Manufacturers & Patentees of every Description of
IMPROVED LAMPS
FOR
Streets, Markets, Shops, &c.
WHOLESALE DEPOT: 52, COMMERCIAL ST., LONDON, E.
We specially solicit Government and Local Board Contracts for General Lighting.

SELF-CONTAINED DUST FUEL FURNACE.



OVER 200 WORKING,
RAISING STEAM WITH COKE DUST, COAL DUST, TOWNS' REFUSE, AND OTHER WASTE FUEL.
GLASGOW: F. J. ROWAN, 121, West Regent Street.
LONDON: WM. BOBY, 16, Union Court, Old Broad Street.
GERMANY, AUSTRIA, BELGIUM, SWITZERLAND, ITALY } ALFRED WENNER, Manchester.

MELDRUM BROS.,
26, HALF STREET, MANCHESTER.

DANIEL HOWARD,

(Successor to the late BENJ. WHITEHOUSE),

GASHOLDER & BOILER WORKS,

WEST BROMWICH, NEAR BIRMINGHAM

(ESTABLISHED 1765).

MANUFACTURER OF TELESCOPIC AND SINGLE GASHOLDERS,

WROUGHT AND CAST IRON TANKS FOR DITTO,

PURIFIERS, CONDENSERS, SCRUBBERS, HYDRAULIC MAINS, and all kinds of GAS APPARATUS,

Wrought-Iron Roofs, Bridges, Girders, &c.,

Steam, Hot Water, and Range Boilers, Tanks, Cisterns, Boats, and all kinds of Wrought-Iron Work.

DRAWINGS, SPECIFICATIONS, AND ESTIMATES SUPPLIED ON APPLICATION.

TELEGRAPHIC ADDRESS: "COCKEY'S FROME."

EDWARD COCKEY & SONS, Ld.,

ESTABLISHED OVER HALF A CENTURY.

Gas Engineers and Contractors for the Erection of Gas-Works.

MANUFACTURERS OF IMPROVED GAS-EXHAUSTING APPARATUS.

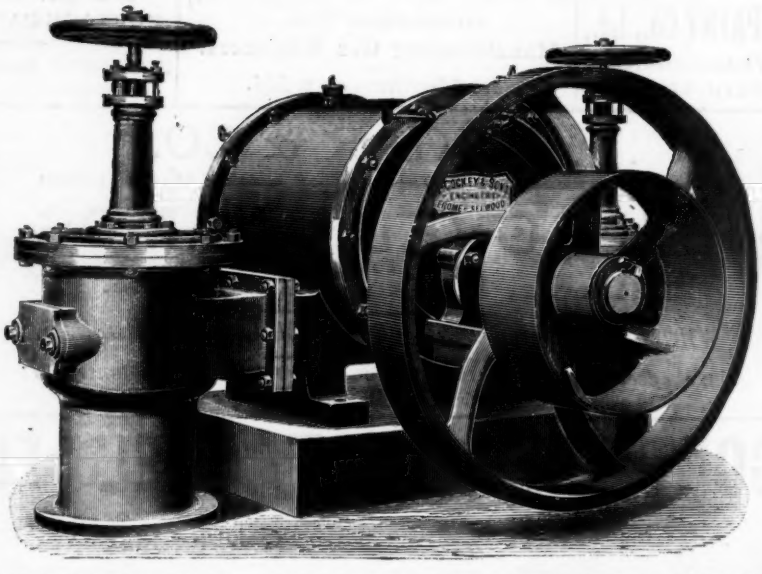
A Large Stock of Valves always on hand.

Lamp Columns; various patterns.

Wood Grids for Purifiers and Scrubbers.

Castings of every description.

Apparatus for the manufacture of Sulphate of Ammonia.



Experienced Retort-Setters constantly employed.

Lead Burning and Plumbing in all its Branches.

Gas-Fittings in great variety.

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Patent Washers and Valves.

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THE IRON-WORKS, FROME SELWOOD, SOMERSET.

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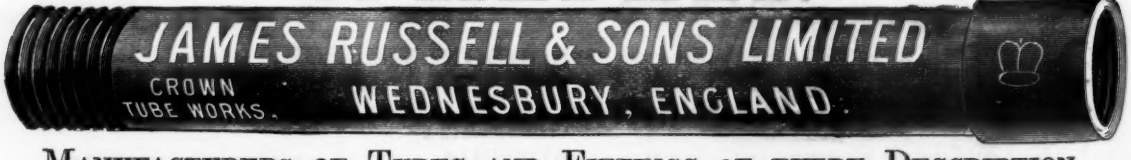

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WROUGHT-IRON OR STEEL MAINS UP TO 6 FEET DIAMETER, FOR GAS, WATER, OIL, OR OTHER PURPOSES.

SCREWING TACKLE, BOILER MOUNTINGS, VALVES, COCKS, ETC.

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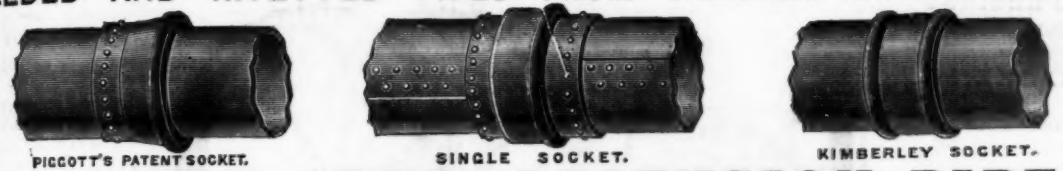
WELDED AND RIVETTED PIPES FROM 8-INCHES DIA. UPWARDS.



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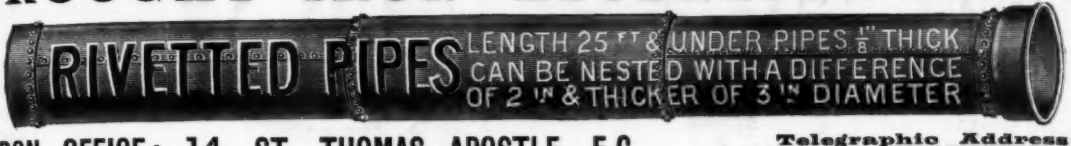

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MANUFACTURERS OF EVERY DESCRIPTION OF

IRON OR STEEL LAP-WELDED OR BUTT-WELDED TUBES

FOR ANY PURPOSE.

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THORNCLIFFE IRON-WORKS, near SHEFFIELD,

MANUFACTURERS OF

SLIDE VALVES, WITH RACK & PINION, OR Internal or External SCREWS, of all Sizes.

GASHOLDERS, AND Gasholder Tanks.

CAST-IRON RETORTS,

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And Retort-House Appliances

of every description.

Iron Roofs, Columns, Girders, Floor Plates and Tools, &c.

WROUGHT AND CAST IRON CONDENSERS, SCRUBBERS, & WASHERS,

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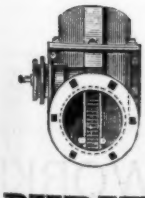
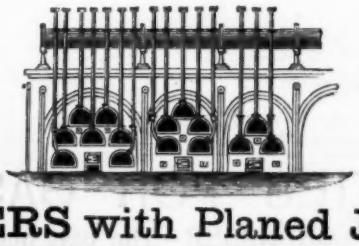
PATENT CENTRE VALVES

for working Purifiers.

Also Bye-Pass & Stop Valves.





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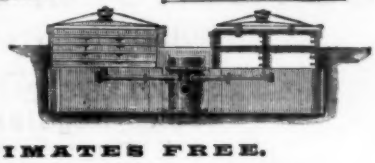


DESIGNS, SPECIFICATIONS, AND ESTIMATES FREE.

Pig Iron (*Special Quality*) for ENGINE CYLINDERS, &c.

GAS COAL FAMOUS FOR ITS UNRIVALLED EXCELLENCE.

CROSSLEY'S "OTTO" GAS-ENGINE.

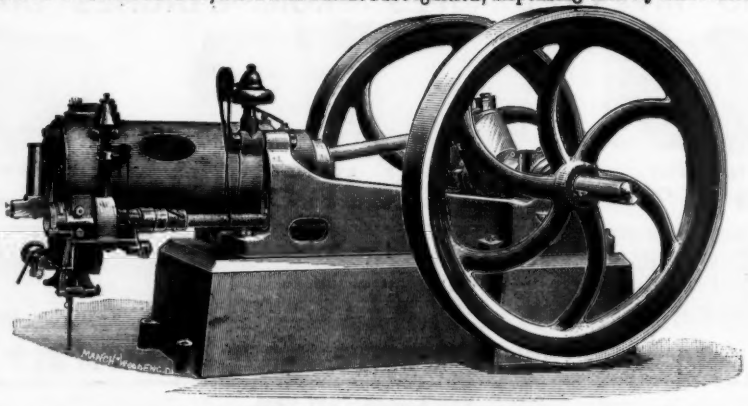
100 Prize Medals.

MADE in SIZES
2-Man to 100-HP.

GAS-ENGINES
COMBINED
WITH
PUMPS
FOR
TOWNS SUPPLY,
SEWAGE, &c., &c.

GAS-ENGINES
COMBINED
WITH
AIR COMPRESSORS
FOR THE
SHONE SEWAGE
SYSTEM, LUCIGEN
LIGHT, &c.

New 14-H.P. Nominal Size, fitted with Patent Tube Ignition, dispensing entirely with Plates.



MADE in SIZES
2-Man to 100-HP.

VERTICAL
AND
HORIZONTAL
TYPES.

ENGINES
COMBINED
WITH
HOISTS, PUMPS,
DYNAMOS &c. &c.

Largely used for
EXHAUSTING,
PUMPING,
COKE CRUSHING,
ELECTRIC LIGHTING,
&c., &c.

Over 31,000 "OTTO" ENGINES are at work.

CROSSLEY BROS., LTD., OPENSHAW, MANCHESTER,

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LIVERPOOL,
GLASGOW,
NEWCASTLE,
BIRMINGHAM,
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HARRIS & PEARSON,

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MANUFACTURERS OF

FIRE-CLAY GAS-RETORTS, FIRE-BRICKS, LUMPS, & TILES of Every Description.

GLAZED BRICKS AND PORCELAIN BATHS.

SAML. CUTLER & SONS, ENGINEERS.

ALL GASHOLDERS

Should be fitted with

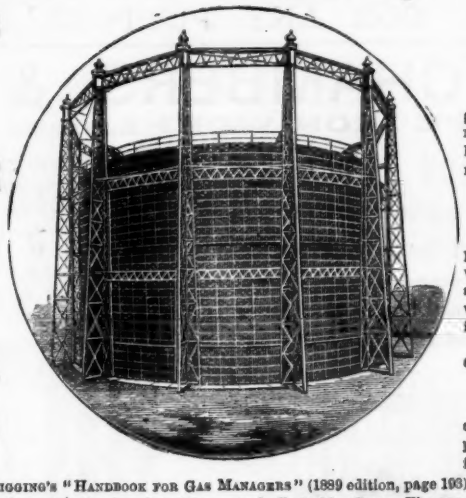
CUTLER'S PATENT
FREEZING PREVENTER

Which has been

APPLIED MOST SUCCESSFULLY

At

LONDON GASLIGHT AND COKE COMPANY; IMPERIAL CONTINENTAL GAS ASSOCIATION; BROMLEY (KENT) YARMOUTH; HERTFORD; KING'S LYNN, &c., &c.



TESTIMONIALS.

Mr. WILLIS, of the Great Yarmouth Gas-Works, writes:

"We had a very sharp frost last night, which gave us a fair opportunity of testing the steam arrangement to Gasholder. You will be pleased to hear it was very effective; in fact, doing all we require."

Mr. Dow, King's Lynn, writes on Jan. 7, 1891:

"The apparatus you fixed to our Gasholder for preventing the water freezing in the cups has had a very good test the last few weeks' severe weather; and it gives me much pleasure to inform you that we have not had the least trouble with ice, and that it is a perfect success."

C. WOODALL, Esq., Palace Chambers, Westminster, writes on Jan. 10, 1891:

"I have fitted to several Gasholders your special apparatus for conveying steam to the cups, and preventing freezing; and it has proved satisfactory."

NEWBIGGING'S "HANDBOOK FOR GAS MANAGERS" (1889 edition, page 193) says:

"Messrs. S. Cutler & Sons have devised an apparatus for preventing freezing of the water in Gasholder Cups. The arrangement is self-acting, compact, and trustworthy."

CUTLER'S SPECIALITIES FOR GAS-WORKS:

MORRIS & CUTLER'S PATENT CONDENSER—The best obtainable.
LIVESEY & TANNER'S TAR AND LIQUOR OVERFLOWS.
CUTLER'S PATENT WATER-VALVES FOR PURIFIERS, &c.
EVERY REQUIREMENT FOR GAS-WORKS AND WATER-WORKS.

Offices: 16, GREAT GEORGE STREET, WESTMINSTER, S.W.
Works: PROVIDENCE IRON-WORKS, MILLWALL, LONDON.
TELEGRAMS: "RETORTUS LONDON."

JOSEPH CLIFF & SONS,

INCORPORATED IN
THE LEEDS FIRE-CLAY COMPANY, Ltd.,
WORTLEY, LEEDS.

LONDON Offices & Depôts:
Baltic Wharf, Waterloo Bridge.
WHARVES NOS. 2 & 4, INSIDE G.N. GOODS YARD, KING'S CROSS, N.
LIVERPOOL:
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MACHINE-MADE RETORTS

Have been made in large quantities for the last twelve years; and during the whole of that time, have been in regular use at most of the largest Gas-Works in the Kingdom. They possess the excellent quality of remaining as near stationary as possible under the varying conditions of their work—a quality which will be appreciated by all Gas Engineers and Managers. The generally expressed opinion is that these Retorts are the very best that are made.

RETORTS CAREFULLY PACKED FOR EXPORT.

Fire-Bricks, Lumps, Tiles, &c., &c., of every description suitable for Gas-Works.

ESTABLISHED MORE THAN A QUARTER OF A CENTURY

WORKS
HUNSLET, LEEDS

LONDON OFFICE:
60, QUEEN VICTORIA STREET E.C.

CLAYTON SON & CO. LTD.

MAKE A

SPECIALTY OF GASHOLDERS

AND MAKERS OF

REG? TELEGRAPHIC ADDRESS: "GAS LEEDS"

GAS PLANT OF EVERY DESCRIPTION.

THE WIGAN COAL & IRON CO., LIMTD.,

Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.

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LONDON DISTRICT OFFICE: 6, STRAND, LONDON—C. PARKER & SON, SOLE AGENTS.
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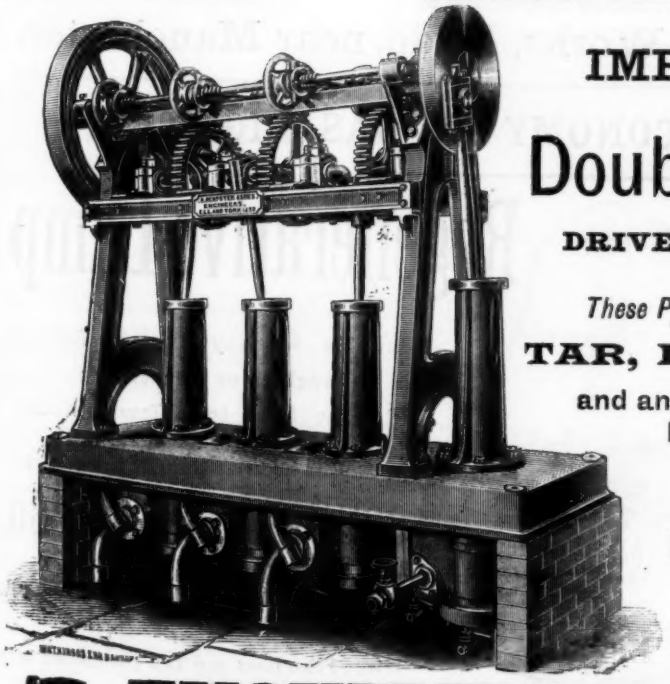
R. DEMPSTER & SONS, Ltd.,

GAS, CHEMICAL, & HYDRAULIC ENGINEERS & CONTRACTORS,

ESTABLISHED — **ELLAND.** — 1855.



IMPROVED BATTERY
OF THREE
Double-Acting Pumps
DRIVEN BY ONE STEAM-ENGINE.

These Pumps are fitted with Valves for pumping
TAR, LIQUOR, and WATER,
and an arrangement by which any of these Liquids may be pumped together or separately.

BEST MATERIALS AND WORKMANSHIP,
AND
EFFICIENCY GUARANTEED.

ENQUIRIES SOLICITED.

JOHN HALL & CO.,

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MANUFACTURERS OF FIRE-BRICKS, LUMPS, TILES,

AND EVERY DESCRIPTION OF FIRE-CLAY GOODS.

RETORTS CAREFULLY PACKED FOR SHIPMENT.

A STOCK OF DIFFERENT SHAPES ON HAND.

GAS AND WATER PIPES

AND

CASTINGS OF EVERY DESCRIPTION.

MANUFACTURED BY THE

CLAY CROSS COMPANY,

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TRADE	TELEGRAMS:	LONDON AGENTS:
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MARK.	CLAY CROSS.	130, GT. SUFFOLK ST., S.E.

SULPHATE OF AMMONIA.

By Her Majesty's Royal Letters Patent.

DR. FELDMANN'S APPARATUS

The most successful and approved Apparatus known up to the present time.

FOR REFERENCES, PARTICULARS, TESTIMONIALS, AND PRICES APPLY TO THE

Sole Agents and Manufacturers,

GODDARD, MASSEY, & WARNER,

ENGINEERS,

NOTTINGHAM.

The Apparatus has been supplied to the following Firms–

BURT, BOULTON, & HAYWOOD, SILVERTOWN, and ELING.
CHANCE BROTHERS, OLDBURY (4 Apparatus).
RUNCORN SOAP & ALKALI CO., Limited, RUNCORN.
NETHAM CHEMICAL CO., Limited, BRISTOL.
ANIMAL CHARCOAL CO., Limited, SHADWELL.
WM. BUTLER & CO., BRISTOL.
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And to the following Gas Companies and Corporations–

ILKESTON.	BURY.	CHORLEY.
WIDNES	BRIGHOUSE.	WHITEHAVEN.
HALIFAX.	MARKET HARBRO'.	CHESTER.
ALTRINCHAM.	PRESCOT.	SOUTH SHIELDS.
DENTON.	SOWERBY BRIDGE.	LEEK.
ST. ALBANS.	LEICESTER.	IPSWICH.
DUKINFIELD.	DARWEN.	BOURNEMOUTH.
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RUSCOE'S PATENT MACHINE

FOR DRILLING AND TAPPING WATER-MAINS AND GAS-MAINS UNDER PRESSURE.

Patent Saddle Back and Drilling Apparatus, whereby Gas and Water Mains can have 2-in., 3-in., 4-in., 5-in., and 6-in. Branches put on without loss of Water or Gas.

Sole Maker of HELPS' PATENT PIPE EXTRACTOR.

Prices and Particulars on Application to

JOHN RUSCOE, Albion Works, Hyde, near Manchester.

SIXTY PER CENT. ECONOMY IN GAS LIGHTING.

The Schülke Regenerative Lamp

FOR

DOMESTIC AND EXTERNAL LIGHTING.

The only Regenerative Lamp employing the Common Flat-Flame Burners.

Lamps giving 20-Candle power consume less than four feet of Gas per hour.

PURE WHITE & PERFECTLY STEADY LIGHT,

NOT AFFECTED BY DRAUGHTS.

Suitable for any existing fittings (Brackets or Suspending).

Can be fixed in a few minutes.

May be seen at the Offices of the

SCHÜLKE GAS-LAMP Co.

LIMITED,

20, HIGH HOLBORN,

LONDON, W.C.,

Where Price Lists and full particulars may be obtained.

KIRKHAM, HULETT, & CHANDLER'S, LTD.,

[SIDNEY HERSEY, Managing Director.] **NEW PATENT** [J. CHANDLER, Engineer.]

"STANDARD" WASHER

EXTRACTS the WHOLE of the AMMONIA

Also a Large Proportion of H_2S and CO_2 from Gas.

Has been in operation over two years at the Beckton Station of The Gaslight and Coke Company. (See below.)

TESTIMONIAL FROM THE CHIEF ENGINEER OF THE GASLIGHT AND COKE COMPANY.

The Gaslight and Coke Company, Horseferry Road, Westminster, S.W.,
Nov. 25, 1889.

Messrs. KIRKHAM, HULETT, AND CHANDLER, LIMITED,

GENTLEMEN,—In reply to your enquiry respecting the result of putting "Wooden Bundles" into some of the Washer-Scrubbers at our Beckton Station, I beg to say they have answered admirably for the few months they have been in; and I think them a decided success.—I am, yours truly,

(Signed) G. C. TREWBY.

Order just received from the BIRMINGHAM Corporation for new patent "Bundles" for RENEWAL THROUGHOUT the 5,000,000 cubic feet per day "Standard" Washer erected in 1882.

For List of "Standard" Washer-Scrubbers supplied of above-mentioned pattern and renewals effected by application of same to old pattern machines, see last and next weeks' issue of the JOURNAL.

PALACE CHAMBERS, BRIDGE STREET,

WESTMINSTER, S.W.

R. & J. DEMPSTER,

GAS PLANT WORKS, NEWTON HEATH, MANCHESTER,

MAKERS AND ERECTORS OF

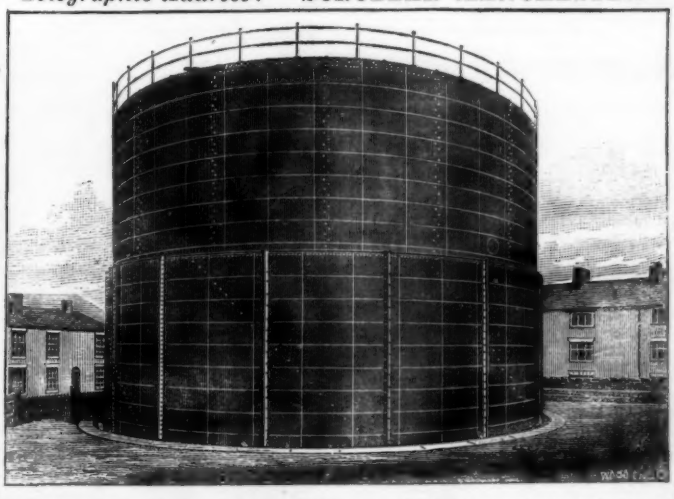
PATENT COLUMNLESS GASHOLDERS.

Telegraphic Address: "SCRUBBER MANCHESTER."

TOTAL WEIGHT REDUCED
from 30 per cent. to 50 per cent.

TRANSPORT AND ERECTION REDUCED
to the same extent; and in cases where gasholders are shipped abroad to places difficult of access, this represents a very large amount of money.

TANK CONSTRUCTION SIMPLIFIED.
The Tank wall (of whatever construction) is a regular cylinder. There are no piers needed, and all expensive foundation stones for the base of columns or standards are dispensed with.



Two-Lift Gasholder erected at the Gas-Works, Northwich, which has been in continuous work since Jan. 3, 1890, and has been subjected to most severe tests from heavy gales, with perfectly satisfactory results.

COST OF PAINTING SAVED
for the Columns and Girders.

TILTING UTTERLY IMPOSSIBLE;
And as there are fewer parts, there is less liability for the Gasholder to get out of order in working.

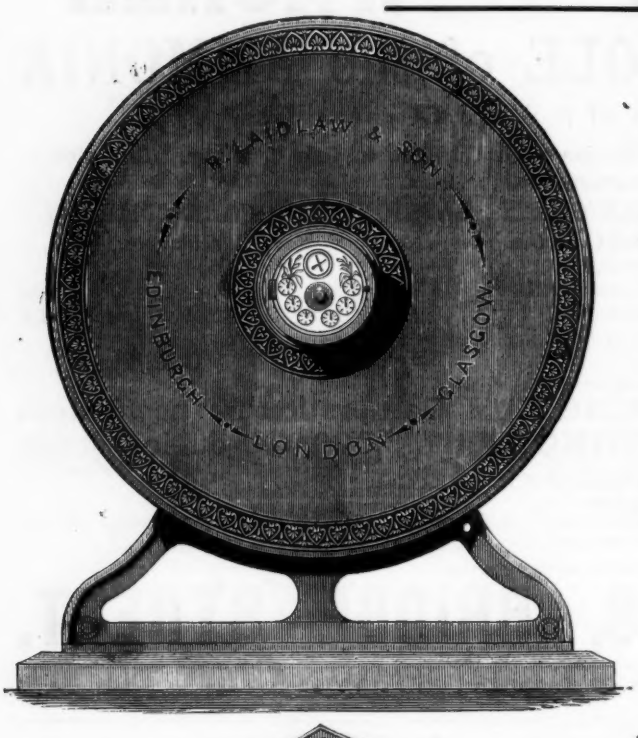
STABILITY UNDER WIND PRESSURE
of a Gasholder constructed upon this system is at least equal to, and from experiments and calculations made is far in excess of, that of a Holder of the same dimensions guided by the elaborate guide framing at present in use.

The removal of heavy guide carriages and rollers from the top curbs considerably lowers the centre of gravity of the structure, and dispenses with the extra strength of sheeting necessary to carry these at the points where they are attached to the gasholder.

The plan adapts itself to telescoping to any reasonable extent, and enables very shallow holders or lifts to be employed with perfect stability.

FOR FURTHER PARTICULARS AND ESTIMATES, APPLY TO THE ABOVE.

R. LAIDLAW & SON'S
STATION METERS
IN ROUND OR SQUARE CASES, ALL SIZES.



Makers in EDINBURGH of

WET AND DRY GAS-METERS,
IMPROVED STATION GOVERNORS,
PRESSURE REGISTERS,
(To Indicate New Time),
PRESSURE GAUGES, TEST HOLDERS,
EXPERIMENTAL HOURLY-RATE METERS,
EXPERIMENTAL TEST-METERS,
CONDENSER THERMOMETERS,
SIEMENS' WATER-METERS,
STREET LANTERNS,
AND ALL KINDS OF
GAS APPARATUS AND FITTINGS, &c.

Makers in GLASGOW of

CAST-IRON PIPES (all Sizes),
LAMP PILLARS,
STEAM-ENGINES AND BOILERS,
PUMPING ENGINES for Water-Works,
BEALE'S GAS EXHAUSTERS,
DOUBLE-FACED SLUICE VALVES,
INTERNAL and EXTERNAL RACK or SCREW SLIDE VALVES,
CAST-IRON COLUMNS,
BEAMS, GIRDERS, and WATER TANKS.
WROUGHT-IRON TUBES, FITTINGS, &c.

Descriptive Price Lists, Estimates, & full particulars forwarded on application.

ALLIANCE FOUNDRY, **GLASGOW.** | SIMON SQUARE WORKS, **EDINBURGH.** | 6, LITTLE BUSH LANE, **LONDON, E.C.**

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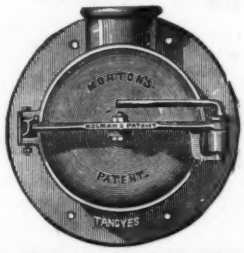
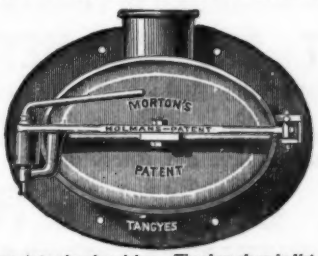
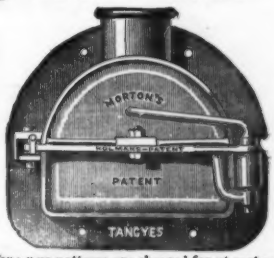
NEWCASTLE-ON-TYNE ST. NICHOLAS BUILDINGS | GLASGOW . . . . . ARGYLE STREET

Sole Makers of **MORTON'S** Patent Self-Sealing **RETORT-LIDS,**

With Anti-Friction CATCHES, and Self-Sustaining CROSS-BARS.







Price of Mouthpieces depends on number required, which please state when inquiring. The sizes given in list we have patterns for; new patterns are charged for at cost price.

These Patent Retort Lids and Fastenings are in extensive use in most of the Gas-Works in Great Britain, America, and on the Continent, and have almost entirely displaced the older method of sealing by a luting of lime or other material. The Lids are made in three forms, D, oval, and round (as shown above), in each of which we have a very extensive variety of patterns, from which Gas Engineers contemplating the adoption of these lids are recommended to make their selection, in order to avoid cost of pattern making, delays, &c., &c.

Mouthpieces with Circular Lids for Oval Retorts.

Pattern No.	Diam. Mouth.	Internal Dimensions of Retort.	Length of Mouthpiece.	PRICE, Lid and Fittings without Mouthpiece.
13658	14 ins.	14 × 12 ins.	15 ins.	£0 19 0
4356	14 „	18½ „ 12 „	19½ „	0 19 0
6851	15 „	16 „ 14 „	18 „	1 0 0
3629	15 „	18½ „ 13½ „	14 „	1 0 0
3580	15 „	21 „ 15 „	15 „	1 0 0
6264	16 „	18½ „ 15½ „	15½ „	1 1 0
5210	16 „	20 „ 14 „	15 „	1 1 0
6263	16 „	24 „ 16 „	13½ „	1 1 0
5370	17 „	20 „ 14 „	14 „	1 3 0
6832	17 „	20 „ 14 „	17 „	1 3 0
6183	17 „	20 „ 15 „	15 „	1 3 0
4289	17 „	21 „ 15 „	14 „	1 3 0
5270	17 „	22 „ 14 „	14 „	1 3 0
3631	18 „	18 „ 14 „	20 „	1 5 0
3681	18 „	21 „ 14 „	13½ or 15 „	1 5 0
3554	18 „	21 „ 15 „	14½ „	1 5 0
7957	18 „	22 „ 16 „	14 „	1 5 0
8048*	19 „	25½ „ 15 „	18 „	1 8 6

Mouthpieces with Oval Lids for Oval Retorts.

Pattern No.	Dimensions of Mouth.	Internal Dimensions of Retort.	Length of Mouthpiece.	PRICE Lid and Fittings without Mouthpiece.
9800	18 × 14½ ins.	18 × 14½ ins.	15 ins.	£1 5 0
9205	20 „ 12 „	24 „ 14 „	10½ „	1 10 0
10000	20½ „ 14½ „	20½ „ 14½ „	15 „	1 10 0
9680	21 „ 15 „	21 „ 15 „	15 „	1 12 0
10056	21 „ 14½ „	21 „ 14½ „	15½ „	1 12 0
13218	21 „ 15 „	21 „ 15 „	17 „	1 12 0
10514	22½ „ 13½ „	22½ „ 13½ „	13½ „	1 13 0
13766	20 „ 17 „	20 „ 17 „	15½ „	1 15 0
13269	24 „ 15 „	24 „ 15 „	16 „	1 18 0

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Mouthpieces for Round Retorts.

Diam. .. .. ins.	14	15	16	17	18
Price, Lid and Fittings without Mouthpiece £	0 19 0	1 0 0	1 1 0	1 3 0	1 5 0

Mouthpieces with Circular Lids for D Retorts.

Pattern No.	Diam. Mouth.	Internal Dimensions of Retort.	Length of Mouthpiece.	PRICE, Lid and Fittings without Mouthpiece.
5348	14 ins.	14 × 18 ins.	7 ins.	£0 19 0
3463	15 „	15 „ 13 „	14 „	1 0 0
6678	15 „	15 „ 14 „	13 „	1 0 0
3661	15½ „	15½ „ 13 „	12 „	1 1 0
13052	16 „	16 „ 13 „	18 „	1 1 0
5601	16 „	16 „ 14 „	15 „	1 1 0
6827	16 „	16 „ 14 „	17 „	1 1 0
4494	16 „	16 „ 14 „	14 „	1 1 0
3548	16 „	16 „ 15 „	12½ „	1 1 0
6677	16 „	16½ „ 13½ „	12½ „	1 1 0
9645	16 „	16½ „ 13½ „	12½ „	1 1 0
4434	16 „	17½ „ 14 „	14 „	1 1 0
6469	16 „	18 „ 14 „	15 „	1 1 0
9015	16 „	18 „ 14 „	18½ „	1 1 0
4327	16 „	18 „ 15 „	15½ „	1 1 0
8049*	16 „	18 „ 15 „	17½ „	1 1 0
6137	16 „	20½ „ 13½ „	13½ „	1 1 0
5918	17 „	18 „ 14 „	14 or 17 „	1 3 0
5053	17 „	19½ „ 12 „	14½ „	1 3 0
7548	17 „	20 „ 13 „	15 „	1 3 0
6468	17 „	20 „ 16 „	15½ „	1 3 0
4316B	17 „	21 „ 14 „	14 „	1 3 0
7975	17 „	21 „ 15 „	14½ „	1 3 0
13459	17 „	21½ „ 13½ „	15 „	1 3 0
12990	18 „	18 „ 15 „	15 or 19 „	1 5 0
7135	18 „	18½ „ 15 „	13 „	1 5 0
10221	18 „	18 „ 16 „	12½ „	1 5 0
4506	18 „	20 „ 13 „	19½ „	1 5 0
6470	18 „	20 „ 13 „	15 „	1 5 0
6818	18 „	20 „ 13½ „	17½ „	1 5 0
4083	18 „	20 „ 15 „	16 „	1 5 0
5306	18 „	20½ „ 14 „	13½ „	1 5 0
13295	18 „	20½ „ 14 „	19½ „	1 5 0
7356	18 „	20½ „ 13½ „	13 „	1 5 0
4569	18 „	21 „ 14 „	18 „	1 5 0
3628	18 „	21 „ 15 „	16 „	1 5 0
7640	18 „	22 „ 12½ „	18½ „	1 5 0
7971*	20 „	20 „ 15 „	18 „	1 11 0

*Patterns marked * have Sockets at back to connect to Retorts; all the others are flanged. Patterns marked B have curved bottoms.* 191

Mouthpieces with D Lids for D Retorts.

Pattern No.	Dimensions of Mouth.	Internal Dimension of Retort.	Length of Mouthpiece.	PRICE, Lid and Fittings without Mouthpiece.
12292	15½ × 13 ins.	15½ × 13 ins.	12 ins.	£1 2 0
9967	16 „ 14 „	16 „ 14 „	15½ „	1 3 0
13574	16½ „ 13½ „	16½ „ 13½ „	12½ „	1 4 0
9899	18 „ 12 „	18 „ 12 „	14 „	1 4 0
12980	16 „ 16 „	16 „ 16 „	18 „	1 6 0
13900	18 „ 13½ „	18 „ 13 „	15 „	1 6 0
9912	18 „ 13½ „	18 „ 13½ „	17 „	1 6 0
9962	18 „ 13½ „	18 „ 13½ „	16 „	1 6 0
10982	18 „ 13½ „	18 „ 14 „	15 „	1 6 0
11098	18 „ 14 „	18 „ 14 „	12 „	1 6 0
9492	20 „ 13 „	20 „ 13 „	15 „	1 10 0
9208	20 „ 13 „	20 „ 13 „	19½ „	1 10 0
10251	20 „ 13 „	20 „ 13 „	15½ „	1 10 0
12964	20 „ 13 „	20 „ 13 „	13½ „	1 10 0
9909	20 „ 13½ „	20 „ 13½ „	17 „	1 10 0
12969	19½ „ 15½ „	19½ „ 15½ „	14 „	1 11 0
13781	20 „ 15 „ Front. / 21 „ 15 „ Back.	21 „ 15 „	15 „	1 11 0
7692	21 „ 15½ „	21 „ 15½ „	16 „	1 11 0
12978	20 „ 16 „	20 „ 16 „	17 „	1 11 0
13252	20 „ 16 „	20 „ 16 „	18 „	1 11 0
13220	21 „ 15 „	21 „ 15 „	17 „	1 11 0
8977	21½ „ 13½ „	21½ „ 13½ „	18½ „	1 11 0
8976	21½ „ 13½ „	21½ „ 13½ „	18½ „	1 12 0
10497	21½ „ 13½ „	21 „ 13½ „	18½ „	1 12 0
8037	21½ „ 13½ „	21½ „ 13½ „	18½ „	1 12 0
9908	21½ „ 13½ „	21½ „ 13½ „	15 „	1 12 0
10404	21½ „ 13½ „	22 „ 14 „	18½ „	1 12 0
12410	21½ „ 13½ „	22 „ 14 „	13 „	1 12 0
13822	21½ „ 13½ „	22 „ 14 „	15 „	1 12 0
10515	22½ „ 13½ „	22½ „ 13½ „	13½ „	1 12 0
7924	24 „ 14 „	24 „ 14 „	15½ „	1 13 0
13807	24 „ 15½ „	24 „ 15½ „	16 „	1 14 0
9015B	25 „ 14 „	25 „ 14 „	13½ „	1 14 0
10932	25 „ 14 „	24 „ 14 „	13½ „	1 15 0
12944B	22 „ 16 „	22 „ 16 „	16 „	1 15 0

Patterns marked B have curved bottoms. 192

HUNT'S PATENT EQUILIBRIUM DIRECT MAIN

GAS GOVERNOR.

In this Governor a throttle valve is substituted for the ordinary suspended cone; all external communication being avoided by placing the lever or radius arm inside the valve chamber upon the disc.

The disc is carried upon steel centres, upon which it is accurately balanced.

4 ins. ...	£17 0	8 ins. ...	£25 0	14 ins. ...	£42 0	20 ins. ...	£60 0
5 „ ..	20 0	10 „ ..	33 0	16 „ ..	46 0	24 „ ..	72 0
6 „ ..	22 10	12 „ ..	38 0	18 „ ..	50 0	36 „ ..	130 0

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ESTABLISHED 1844.] **ORIGINAL MAKERS.** [ESTABLISHED 1844.]

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Dublin, 1865. Paris, 1867.

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1st—Are a remedy for all the defects of Wet Meters.
2nd—Are suitable for all climates, whether hot or cold.
3rd—Incur no loss of Gas by Evaporation.
4th—Cannot become fixed by Frost, however severe.
5th—Are the most accurate and unvarying measurers of Gas.
6th—Prevent jumping or unexpected extinction of the Lights.
7th—May be fixed either above or below the level of the Lights.
8th—Cannot be tampered with without visibly damaging the outer case.
9th—Will last much longer than Wet Meters.
10th—Will not cost more than one-half for repair that Wet or Water Meters do.

Are upheld for five years without charge.

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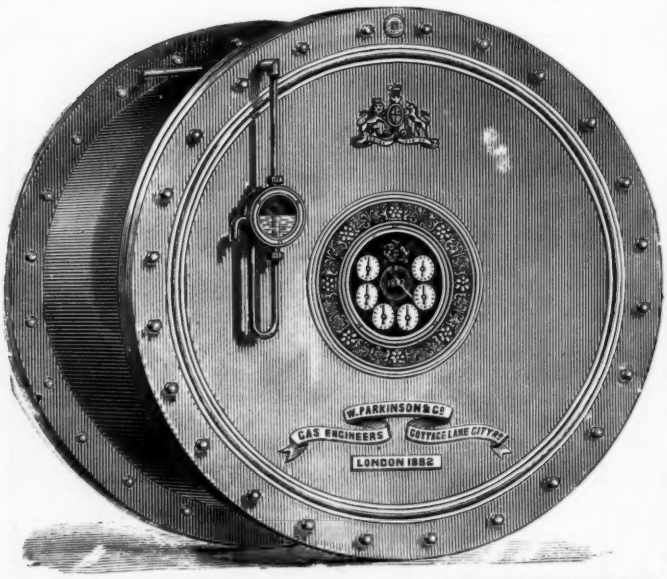

STATION METERS

IN

ROUND or SQUARE TANKS,

FITTED WITH PATENT

THREE-PARTITION DRUMS.

MORE THAN

300 STATION METERS,

Varying in size from 1200 to 200,000 cubic feet per hour, have been sold, fitted with

THREE-PARTITION DRUMS,

Since their introduction.

ROUND METERS as above are kept in Stock in all Sizes ready to send away at the shortest notice. Compact, portable, and very easily fixed. An Improved Overflow Water-line Regulator fitted to every Meter.

DURABILITY UNEQUALLED. SOME HAVE BEEN IN CONSTANT USE FOR OVER 60 YEARS.

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MANCHESTER.
Telegraphic Address: "PRECISION."

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TITLE AND INDEX TO VOL. LVI.

The Title-page and Index to Vol. LVI. of the JOURNAL (July to December, 1890) are now ready; and, as usual, a copy will be forwarded post free by the Publisher, on receipt of a post card from any subscriber.

TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer: not necessarily for publication, but as a proof of good faith.

THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, FEBRUARY 3, 1891.

The Chartered Report and Accounts.

THE report of the Directors of The Gaslight and Coke Company, which accompanies the statement of accounts for the past half year that appears in another column, was published in last week's JOURNAL, having come to hand just in time to save the press. We could not comment upon it, however, and shall therefore take both report and accounts into consideration together. And, according to general opinion, they reveal a state of things which calls for very particular consideration indeed, both within and outside the Company. Something unpleasantly like a small panic declared itself in the City upon the appearance of the figures relating to the past half-year's working of the concern; and although we believe that the sharp fall in the value of the Company's stock, which was such a notable feature of the investment market last week, was not altogether reasonable, it is unpleasant to hear such expressions as "living in a Fool's Paradise" bandied about respecting the state of the shareholders of the largest Gas Company in the world. The position of gas stock is peculiar just now. It is no longer credited with unquestionable stability. People are curiously watching Chartered affairs in particular for evidence that the London electric lighting companies, all of which are in this Company's district, have succeeded in withdrawing custom from the "old shop." Every one of these new ventures claims to be doing good and increasing business; and the public are naturally indisposed to believe that this is all done at the expense of the oil and candle interests. There must be some such disposition as this on the part of the public, or else it is difficult to understand why the investment market should have been so agitated over the mere statement that the sum of £145,695 must be drawn from reserve in order to pay the dividend recommended by the Directors. Yet if this is the feeling, the heavy increase of 5 per cent. in the sale of gas for the past half year ought to have calmed it. Whatever may be the interpretation, however, the fact remains, as our Money Market report to-day shows, that the statement relating to the present position of The Gaslight and Coke Company was not at all well received in the City.

This disfavour, as we have already remarked, is not fully warranted. If reserves are never to be drawn upon to equalize dividends, it is difficult to understand the use of them. Making the very worst of what has happened, the Chartered reserve has been reduced from £531,395 to £385,699, which is not a bad one in any sense, except by comparison with what has been. The alarmists cry out, however, that continued at this rate of reduction the cash-box will very soon be empty. So it would be, doubtless, if the depletion were to go on unchecked. But will this be the case? The Chartered accounts have betrayed startling oscillations upon former occasions. A few hundreds of thousands of pounds more or less on one side or the other have seemed to make little difference to the dividend; and our columns have borne repeated witness to the enigmatical nature of Horseferry Road finance, which has appeared to be swallowing up the balance one year, only to reduce the price of gas a few months after such a course had been officially declared undesirable. This time there is a difference. The Directors have only earned a net balance of £209,895 (including £7392 brought forward) wherewith to pay £355,590, which is the amount of a 13 per cent. dividend on the ordinary stock. A year ago the dividend was after the rate of 13¾ per cent. That slice of £145,695 out of the reserve to pay a diminished dividend, notwithstanding the addition of 3d. per 1000 cubic feet to the price of gas, has given the City a great shock. If it had not been for that opportune threepence, which has been good for £115,000, the disposable profit would only have been about £95,000! The figures are certainly startling. No wonder the Company wanted their "pound of flesh" out of the South Metropolitan Company.

The only explanation offered by the Board for this condition of things is contained in the two sentences of the report which state that "the exceptionally high prices of "coal and cannel during the past half year have had an "adverse influence upon profitable working." The half year has also borne to the full extent the heavy "additional "outlay for wages now paid to all classes of workmen." The accounts show what these remarks mean. Coals used for gas manufacture have cost the Company £788,989 as against £553,887, or an increase of £235,102; and labour (carbonizing) has increased from £162,010 to £180,825, or a rise of £18,815. This latter is nothing very terrible; but it must be remembered that a year ago the eight-hour system had already been adopted. Still, the two increases together considerably exceed a quarter of a million; and the shareholders have reason to ask if this addition to the cost of working is likely to be permanent, and, if so, how it is to be borne out of revenue. The public also have occasion to inquire whether the price of gas is likely to

be put up again. The shareholder for his dividend, and the consumer for his gas bill—both classes of the community interested in Chartered affairs are likely to stare rather blankly at the figures put before the world by the Directors.

With regard to the increased cost of labour, this is a source of expense with which the Board are not likely to be reproached. It is a different thing with respect to the price they pay for coals. Last year the Governor (Colonel Makins, M.P.) spoke of the Company having to pay a very much higher price for coals; and he did so in a light-hearted style which revived memories of the fashion in which the ill-fated M. Ollivier spoke of the declaration of war between France and Prussia. Moreover, he turned aside, in a way more adroit than convincing, Mr. Livesey's suggestion that, by working in greater harmony, the Boards of the London Gas Companies might obtain their supplies of coal upon better terms. Well, the first half year of the new coal contracts, upon which the Chartered Directors plumed themselves with so much satisfaction, has expired; and what is the result so far? That every ton of coal carbonized cost the Company 15s. 10·32d., as compared with 11s. 9·6d. per ton, which was the price paid during the latter half of 1889. And this exorbitant rate, according to the Governor, will hold good at least until next Midsummer. The only conclusion to be drawn from these figures is that the Board was what is popularly and expressively called "had flying" in the matter of their coal contracts of last year. Opinions may differ with regard to what constitutes good gas management; but to throw away money through ill-advised coal contracts was never yet regarded as a thing to be proud of in any Gas Company's Board-room situated out of Westminster. There may be reasons why coal should be bought too dear; and if any such exist in this case they will be duly paraded on Friday.

Comparisons of the revenue account of the Company for the past half year with previous corresponding periods are vitiated by altered conditions. Thus gas-rental brought in £1,309,802; but though this amount exceeded the December rental of 1889 by £168,109, about £115,000 of the difference is due to the increased price—leaving the natural increase about £53,000. Meter and stove rentals show a satisfactory elasticity, especially the latter. Coke, thanks to the hard winter, went up from £228,429 to £277,053. Tar rose from £88,145 to £116,460; but ammonia fell from £84,267 to £65,222. Altogether, the credit total was £1,813,995, as compared with £1,582,946 for the December half of 1889. The most striking entry on the other side has already been dealt with. Repairs and maintenance have been fairly kept up; the charge under this head being increased from £144,915 to £178,727. There are no other entries requiring special mention, if we except the apparently heavy surveyors' charges in connection with the quinquennial valuation, which are referred to in the report. Time was when the Governor professed the belief that it would be idle for a wealthy Gas Company to fight rating appeals against Parish Assessment Committees; but he has evidently altered his views on this subject. With regard to the general balance-sheet, which shows the enormous stock of 352,065 tons of coal, valued at £274,651, or after the rate of 15s. 7·2d. per ton, it can hardly be contended that the Company have erred on the side of moderation in estimate. Perhaps Colonel Makins will have something reassuring to say on this head, which is too important to be passed over in silence. For this and other reasons, Friday's meeting ought to be of more than average interest.

The Explanation of the Glasgow Gasholder Catastrophe.

It is with a sense of relief that we are able this week to give as complete an account as the interests of the gas industry demand of the cause and character of the Dawsholm gasholder explosion. There can be no remaining shadow of doubt respecting these essentials in the mind of any person competent to form an opinion upon the subject, after perusal of the report of the experts and our statement of the facts. It is simply a case of dynamite. If we are not able to wind up the story by showing how the explosive was placed in a position which enabled it to do so much mischief, what the explosive substance was, and who was instrumental in perpetrating the outrage, these pieces of information, while interesting enough in their way, are of more local than general importance. Whether the crime was a spontaneous result of local spite against anybody, or had any connection with the railway men's strike, or was meant to commemorate the less effective performance of the same kind that rendered the last Fenian scare in Glasgow notorious, must remain doubtful until the police succeed in arresting the criminal, if they ever do so. The Gas Committee have offered a reward of £1000 for the discovery of the criminal, which is money enough to purchase any amount of Queen's evidence, if there is any in the market. A job of this kind, in the particular locality chosen, and in the special circumstances, could be done as well by one man as by a dozen; and it is in the highest degree improbable that more than one was actually engaged in it. The only help such a miscreant would need would be in obtaining the explosive; and if he is not traced in this way, it is safe to suppose that he will never be found. It may be said that there is little comfort in the thought that any man with a dynamite cartridge and the will to use it can wreck a gasholder; but this is a crude way of drawing an inference from the Dawsholm catastrophe which takes many things for granted. In the first place, such an individual, so equipped, might unquestionably make war upon civilization in a variety of ways until arrested, as he would inevitably be in the end. There is no profit to be made out of the destruction of gasholders; and even at Dawsholm, although the damage done was on a more wholesale scale than most gas engineers would have previously admitted to be possible, the consequences were such as to disappoint any designer of the mode of attack upon the Gas Committee or the Corporation who aimed at murder, fire, and the general wreck of the town. Thanks to the splendid conduct of Mr. A. Wilson, the Manager of the works, and the valve-man M'Alister, both of whom did their duty nobly in an emergency calculated to try the nerve of the bravest, the gas supply of the district served from this station was really only interrupted for about five minutes. The damaged holders will cost a considerable sum to repair, and that is all. Certainly, if an intending dynamiter preserves any method in his madness, he may be trusted to conclude that not even the grand pyrotechnic display with which Glasgow was favoured by the enterprise of one of the order, can be regarded as paying for the risk and trouble of bringing it about. It is not for us to indicate such applications of dynamite as might be expected to do very much more damage, and cause infinitely more suffering and loss to the community, than anything that could be done by the same agency in a gas-works. Meanwhile, the most practical lesson that can be drawn from the Dawsholm outrage is that it is desirable to remove the means which exist in connection with most gasholders for giving an active trespasser ready access to the upper parts of the structure. At Dawsholm the opportunity existed both for throwing anything upon the crown of the holder nearest the railway viaduct, and also for climbing the columns by means of the lattice bars supporting the channel guides. Such a state of things is common; and fixed ladders for giving access to the crown are equally general. This must evidently no longer be. A length of the fixed ladder must be removed, and obstacles placed in the way of climbing the standards at irregular times and for unauthorized purposes. We do not suppose that either this precaution, or keeping a sharper guard upon the yard, will infallibly prevent outrages; but they would render them less easy to perpetrate, and, in the event of an accident, would show the public that something to the purpose had been learnt by engineers from the Glasgow incident. Of course, now that the affair has been so thoroughly explained, there will be no need for any further inquiry. We sympathize with the Gas Committee and their Engineer, Mr. Foulis, in respect of the trouble and worry which this regrettable occurrence must have brought upon them; but at the same time they are to be congratulated upon the smallness of the injury to person and property that has followed what was really a terrifying disaster, and praised for the admirable manner in which they have dealt with an event unprecedented in the history of the gas industry.

Labour Agitators at Fault.

At last it may be said that the Scotch Railway Strike has broken down, and that the redoubtable John Burns has added one more to his brilliant series of failures. There seems to be a fair amount of agreement upon the act that

the Scotch railway workers once had a substantial grievance, on the score of long hours, against their employers. It is easy to see how this state of things has arisen, and equally easy to believe that some railway managers need a little pressure to cause them to reconsider working arrangements that on the whole suit them. Unfortunately, when the Scotch railway men struck, they did so in the most wrong-headed fashion; and all their subsequent behaviour had no reference to the original grievance. Like the South Metropolitan gas stokers, their true object was to gain the mastery over their employers. What the consequences would have been if this attempt had succeeded, we shall not endeavour to define, since it has failed through its own weakness and the strength of the position taken up by the Companies. The course of the conflict has been marked with the usual incidents. The employers depended upon the power of the law, and the strikers upon their ability to evade and defy it. Moreover, the employers have held the same language and told the same story from beginning to end; while the strikers have been fed with the most reckless misrepresentations and unblushing lies. Again, the employers have done a great deal and said little; while the strike leaders have spoken volumes and done nothing to the purpose. The ingenious Mr. Michael Davitt has spared as much consideration as he could divert from the Irish affairs which are nearer his heart, to encourage the Scotch rebels with argument and assistance through his journal the *Labour World*. Several pounds have been collected for the strike funds, and duly acknowledged in this curious publication, which weekly offers to the British workman a mess of Socialism and Irish Nationalism, made more attractive by spicy police reports and selected humour (?) from the American newspapers. Not even Mr. Davitt's help, however, has been sufficient to convert defeated Wrong into triumphant Right in the South of Scotland. The other topic of the week in connection with the cause of Labour is the attempt of Mr. E. Robertson, M.P., to alter the law of conspiracy in the sense of what he called "removing a practical injustice," but which the majority of the House of Commons thought would prove a dangerous concession to lawlessness. If Mr. Robertson and his supporters had had their way, the verdict in the Plymouth intimidation case would be among the last efforts of the administrators of a cumbrous yet fairly effective law to curb the will of Trade Union officialdom. These gentry appear to desire a short Act of one clause, stating merely that "whatever an official of "a Trade Union does for the sake of his Union shall be "deemed right and lawful." Short of such license, it is to be feared that no enlargement of an old-fashioned law would be found to content them for long. Even then, they would in all probability soon clamour for another Act making it penal for any employer to do anything contrary to Trade Union principles—such principles, of course, to be determinable by any two or more Society men with clear cards. It is a very plausible way of putting the matter, to argue that no combination should be interfered with by law for doing what individuals may do with impunity; but it hardly needed the heavy artillery of Mr. Gainsford Bruce and Mr. Darling to persuade the House of Commons that such a generalization would work badly, if at all. On the whole, the Labour agitators cannot be said to have been doing very well of late anywhere.

Brentford Gas Company.—The Directors of the Brentford Gas Company recommend dividends for the half year ending Dec. 31 last at the rates of 5, 9¼, and 12¼ per cent. per annum; carrying forward £43,448.

Death of Mr. W. Cash.—The death is announced, from heart disease, of Mr. W. Cash, Secretary of the Bournemouth Gas and Water Company and of the South African Lighting Association, Limited. The deceased gentleman was a member of the firm of Messrs. Cash, Stone, and Co., Chartered Accountants.

Society of Engineers.—The first ordinary meeting of this Society for the present session was held at the Town Hall, Westminster, last night, when the Past-President (Mr. H. Adams, M. Inst. C.E.) presented the premiums awarded for papers read last year, and the new President (Mr. W. N. Colam) delivered his Inaugural Address.

Resignation of Mr. Alfred Kitt.—We learn that Mr. Alfred Kitt has terminated his connection with The Gaslight and Coke Company, as from last Saturday, after 27 years' service; and that he will be succeeded in the management of the Lupus Street works by Mr. Lacey, who was formerly assistant to Mr. Trewby at Beckton. Mr. Kitt has just opened offices at No. 5, Victoria Street, Westminster, where he purposes commencing practice as a Civil and Consulting Gas Engineer.

REFLECTIONS UPON THE FINANCIAL ASPECT OF THE CHARTERED COMPANY'S AFFAIRS.

COMMUNICATED.

A copy of the report and accounts of The Gaslight and Coke Company for the half year ending December, 1890, has now been in hand a week; thus affording the advantage of leisurely and careful consideration of a very grave subject. This consideration impels me to seek the aid of the JOURNAL to speak out plainly with regard to the policy and management of the great leading Gas Company. How great that Company is may be in some degree realized from the fact that its single business alone exceeds in magnitude the united undertakings of the Corporations of Manchester, Birmingham, Leeds, and Glasgow, and of the Liverpool, Sheffield, and Newcastle Companies. It is, therefore, the enormously preponderating factor in swaying the market value and stability of gas securities as a class. Speaking broadly, the quotation of "Gas A" (as the ordinary stock of The Gaslight and Coke Company is called on the Stock Exchange) largely rules the rest. An interest in the fortunes of that Company is, therefore, not confined to the proprietors of that undertaking, but is shared in a lesser degree by proprietors of gas securities in general. The subject of the following remarks consequently touches readers of the JOURNAL as a body.

In the report under consideration, the Directors recommend a dividend at the rate of 13 per cent. The amount required to pay this dividend is £355,590. The earnings of the half year, after paying fixed charges, leave a balance of only £196,300. When to this there has been added the £7400, balance brought from the last account, and the £6200 recovered from the South Metropolitan Company, there still remains a deficiency of £145,700. In other words, the Company have earned a little more than 7 per cent., and are going to divide 13 per cent. But this is not all. For the two preceding half years the Company drew about £280,000 out of their balance in hand, in order to provide the difference between the dividends earned and the dividends declared. So that altogether the Company will have paid away in dividends for the last three half years no less than £430,000 in excess of their earnings—entirely absorbing the handsome balance of £286,000 they had in hand at the commencement of that period, and depleting the reserve fund from its then figure of £517,000 to about £385,000. How long will this last? From depletion to deletion *facilis est descensus*. During the period over which this £430,000 has been drawn from the reserves of the Company, the average prices of coal and labour were considerably lighter than those which now rule; and though there may be a reasonable anticipation that the price of the former, at least, will fall rather than rise, nevertheless the relief will not yet be felt. Indeed, it is not improbable that the pinch of high prices will be felt in the current half year as sharply as in the last, if not more so. Nor must too much reliance, *per contra*, be placed in the higher returns from residuals, for they are incommensurate to balance the cost of the manufacture of gas. To illustrate this, the cost of manufacture to the Company last half year was more than 6d. per 1000 cubic feet above the cost of the corresponding half of the previous year; while the returns from residuals were not quite 1d. more. There is, therefore, great reason to fear that if the price of the Company's gas is continued at 2s. 9d. per 1000 cubic feet, and the dividend is maintained at the rate of 13 per cent., the Company will at the end of the current half year be within a perilous distance of seeing to the bottom of their £385,000 reserve fund. And what then? The dividend must drop to whatever figure the price of gas may warrant, and the earnings suffice to provide. This is not at all a pleasant prospect; but it is one which should be resolutely looked in the face. Is it wise to continue drawing so much out of the concern beyond its earnings? Would any prudent merchant do so? Would he not rather cut down his private expenditure till better times, keeping his business all the sounder though for a while less productive? We rather think he would; and if he did not, the fact would not assist him at his final examination in Portugal Street.

What then is to be done? Everyone is strongly of

opinion that the Company cannot afford to sell gas at the present price of 2s. 9d. per 1000 feet. For the first half of 1890, when that short-lived and injudicious reduction of the price to 2s. 6d. was in force, it would have required that the price should have been higher by no less than 5d. per 1000 feet in order to provide the dividend paid, even reduced as it then was from 13¾ to 13 per cent. For the last half of 1890, although the price had been raised from 2s. 6d. to 2s. 9d., it would require that the price should have been nearly 4d. per 1000 cubic feet higher in order to provide the dividend recommended. The rise in price, even upon a 5 per cent. larger sale of gas resulting from exceptionally cold weather, was insufficient to meet the necessities of the case; though the Directors may be sympathized with in their reluctance to make the big jump of 6d. per 1000 feet. But facts must now be faced. The "ostrich policy" of shutting the eyes and burying the head in the sand of oblivion, if ever it found an advocate, must not be tolerated now. The matter demands courageous and resolute treatment; and the longer it is postponed, and the longer matters are allowed to drift, the more heroic must be the ultimate remedy. If the Company will at the earliest date possible raise their price to (say) 3s. per 1000 feet, and will discontinue the ruinous trade of selling their commodity at too near cost price to yield a fair margin of profits; if they will at the end of the financial half year divide such an amount of profits as their trading may warrant, even though it may involve a reduction in the rate of dividend, which may be unpalatable to buyers of stock at inflated prices—they will secure two great points which should always be borne in view by the responsible managers of a public company: First, the intrinsic soundness and stability of the undertaking; and, second, its public reputation, which stamps the value of its stock as a realizable security. This is quite certain: That a company which pays a dividend within its strength, and with a growing reserve fund, commands a better value in the market than one which strains itself beyond its strength. Strains rupture men, materials, and mercantile adventures. A secure 10 per cent. dividend is better than a shaky 13 per cent., with the prospect of an abysmal drop when it gives way. It is the greed of high dividends that has led astray; and in this respect other companies than The Gaslight and Coke Company have erred, though their lesson (and their day of repentance, too, if they fail to profit by their lesson) may be deferred. "Fortune brings in some boats that are not steered." Maybe; but good navigation is better for the boat, and for those who have to sink or swim with her.

The Meteorology of Nottingham.—We have received a copy of the chart and statistical tables of the meteorology of Nottingham for the past year, prepared by Mr. A. Brown, M. Inst. C.E., the Borough Engineer, and Mr. P. Boobbyer, M.B., the Medical Officer of Health, with the assistance of several local gentlemen. The observations recorded are in continuation of those instituted by the late Mr. Ogle Tarbotton, and agree with those supplied weekly and monthly to the Registrar-General.

Long Service in Gas-Works.—A great deal is sometimes said about the unhealthy nature of gas workers' duties. Of course, the presence of hale old men still "in harness" in gas-works is a standing disproof of this; and the prizes given annually by the Société Technique to meritorious workmen for long service, always bring forward a number of applicants who are capable of presenting a good record. In the JOURNAL a few weeks ago we mentioned the fact that the Manager of one of the gas-works of the Bolton Corporation had been associated with the undertaking for upwards of half a century; and we are now pleased to find that Mr. C. Bird, Manager of the Rochester Gas-Works, can boast of an unbroken connection of 51 years with his Company.

The Transactions of The Gas Institute for 1890.—We have received from the Secretary of the Incorporated Gas Institute (Mr. W. H. Harvey, B.A.) a copy of the Transactions of the Institute for the past year. The volume consists of reports of the proceedings at the annual meeting held at Ryde in June last, and at that of the donors and subscribers to the Benevolent Fund in the following month, together with the list of members, the Board of Trade Licence, and the Memorandum and Articles of Association of the Institute. In an appendix are given the communications, which, owing to want of time, could not be read at the annual meeting. These were: "Experiments on Oxygenated Oil Gas (Tatham's Process) as an Illuminant," by Dr. L. T. Thorne; "Illuminating Water Gas," by Mr. R. S. Moss; "Shall Gas Undertakings Supply Electricity," by Mr. A. F. Guy.

WATER AND SANITARY AFFAIRS.

THE Metropolis Water Supply Bill of the Vestry delegates has obtained its first reading in the House of Commons, with every probability that it will be included in one general arrangement, by which all the Bills affecting the water supply of the Metropolis will, as soon as they have passed their second reading, be referred to one and the same Committee. A reply given to Mr. Lawson by Mr. W. H. Smith, although not perfectly definite or final in its character, indicates that the reference will be either to a strong Hybrid Committee, or to a Joint Committee of both Houses. The latter course, we may assume, is the least likely of the two; but, whichever plan is adopted, there will be little room left for the "inquiry" which has been solicited at the hands of the Government by the London County Council. The Liberal members of Parliament representing London have conferred together on the subject of the Water Bills, and have adopted a resolution, not very neatly constructed, declaring that "the most urgent question with regard to "the water supply of the Metropolis is to prevent the "Water Companies from raising their rates" as a consequence of the quinquennial valuation; thereby "enhancing "the capital value of their undertakings in view of pur- "chase by the public." Animated by this consideration, the members subscribing to the resolution are going to do their utmost in support of Mr. Causton's Metropolitan Water Companies' Charges Bill. The London Liberal members, therefore, have an idea that the water undertakings should be purchased; but they are desirous that the value of the property should be kept down as much as possible in the meantime. Of course, they have no desire for the law to nullify the change in the assessment in those somewhat numerous cases in which the rateable value is lowered by the new valuation. No account also is taken of the fact that the Companies have nothing to do with fixing the rateable value. This is the affair of the parish authorities, with some of whom the County Council have a serious quarrel, on the ground that the assessments are too low.

Some interesting and important particulars concerning the Metropolis Water Supply Bill of the Vestries will be found in another part of our columns. The information presents itself in the form of a "Memorandum" from the Executive Committee, and is issued from the Vestry Hall of St. James, Westminster. The principles which lie at the root of the Vestry Bill are thus declared with authority; and some useful light is accordingly obtained. More than fifty clauses enter into the composition of the Bill; and its "fundamental principle" is stated to be "the acquisition "of the undertakings of the existing Companies, and the "supplementing of the present supply from two sources." These latter are to be found at Rickmansworth and Leatherhead. There is a curious two-edgedness about the Vestry Bill, which is well brought out by the terms of the "Memorandum." It is proposed by the Bill to create a Trust of 39 members, but to reserve to the London County Council power by resolution to undertake the duties imposed by the Bill on the Trust, and thus render the creation of the Trust unnecessary. Naturally enough, "it is not expected that the Bill will pass in this form;" and admirable reasons are given why the Trust should have possession of the water supply rather than the Council. A serious difficulty stands in the way of the latter. Not only is the area of the water supply by the Companies much larger than the County of London, but the system of distribution is so extensively interlaced among the various outlying districts, as to render the supply of water in bulk to the local authorities impracticable. "Hence the only alternative seems to be a "power of equal rating throughout the area of supply." But is it probable that Parliament will confer upon one authority, such as the London County Council, power to levy rates for any purpose whatever within the jurisdiction of another constituted authority? This point is marked "doubtful;" and there is yet something more behind. Circumstances may, we are told, "necessitate the raising "of a rate at a very early period," should the public water supply fail to be self-supporting. The "rate" thus intended is evidently different from a mere ordinary charge levied on the consumer; and before being subjected to such an impost, the ratepayers of the outer ring will clearly require to be represented at the centre. It is left to the

wisdom of Parliament to decide between the alternative of committing the water supply to the County Council or to a Water Trust representative of the entire area of the supply. Into the terms of purchase we need not at present enter, except to say that we see much of an objectionable nature in the arguments of the Executive Committee of the Metropolitan Vestries and District Boards on this point. In a conference held between the Vestry delegates and sundry members of Parliament concerning the Metropolis Water Supply Bill, it is curious to find that Mr. Baumann, who backs the Bill with his name, not only objected to handing over the water supply to the County Council, but expressed a preference for the form of Trust included in the Bill of the City Corporation. Mr. Mark Judge also declared himself opposed to the plan of making the County Council the Water Authority. On the other hand, Mr. James Beal stood up for the Council, as might be expected. We should rather like to know what was Mr. Baumann's warrant for stating at this conference, that "even the Water Companies were now agreed that some "public body should be constituted for the management "of the water supply of London." We apprehend that the remark requires some qualification.

It remains for us to say a word on the London Water (Meter) Bill, which also receives the support of Mr. Baumann. If the consumer is to be at liberty to take his supply by meter, so as to pay only for what he actually consumes, who is to pay for the public supply—that is to say, for the public benefits arising out of the existence of the water supply in the midst of a large population; these benefits including a provision for the extinction of fires? When the water supply is in the hands of a public authority, a rate can be levied in aid of the income, and in that case the private consumption can be made a separate charge. But equity demands that a Water Company shall have the equivalent of a public rate in the charge on the private consumer. It is this that justifies a charge based on rateable value.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 215.)

THERE have been considerable and important changes in the state of public affairs since our last issue; but the stock markets have somehow or other failed to respond to the movement as they might have been expected to do. The malign influences to which we adverted have been abated in some cases and mitigated in others. The cessation of the railway strike, the more promising aspect of the United States silver question, the improved weather for trade and traffic, the hopeful anticipation of a favourable budget, and the further reduction on Thursday last of the Bank rate from 3½ to 3 per cent., have combined to facilitate the resumption of normal activity in the stock markets. But for all that, the machinery has not got into full play; having become somewhat stiff and clogged through disuse. First-class securities are still doing the best, as is naturally the case when money is superabundant, and has become (to use a popular expression) almost a drug in the market. In the Gas Market attention has, of course, centred in Gaslight and Coke issues. Gaslight "A" fell 3 on Tuesday, when the report and accounts were to hand; and it fell 7 more the next day—the lowest figure at which business was marked being 234. The wonder is that it did not drop more; for the data afforded by the official issue are highly unsatisfactory. But the market has repeatedly shown itself strangely insensible or indifferent to facts, as we have had occasion ere now to remark. When the previous half-year's accounts came out, they plainly conveyed to any reflecting mind that the financial policy of the Company was unsound, and was weakening their position. Yet the stock rose. The present report and accounts reveal that this policy is being persisted in. To our way of thinking, it is a spendthrift policy, and one which is fraught with danger. The undertaking is a splendid property, of enormous strength and vitality; but the finest property in the world will not stand having its strength sapped and undermined for ever. South Metropolitans maintain their position of the preceding week. Commercials are very quiet and firm. In Suburbans and Provincials, there is no change to note. The Brentford Company will pay dividends at the same rate as for the previous half year, and up to the full statutory figures. The rise of 2d. in the price of their gas appears to have enabled them to increase their balance in hand by some £8000. Among Foreigners, Imperial Continental is steady at the old figures. European declare a dividend of 8s. per share. South Americans are further depressed by the public financial difficulties. Moderate business has been done in Water; and prices tend upwards.

The daily operations were: Gas opened rather quiet; and prices generally were very good, but Buenos Ayres fell ½. On Tuesday, Gaslights almost engrossed attention; "A" falling 3. Monte Video was ½ lower; but Melbourne rose 1. On Wednesday, business was mostly in Gaslight "A," which fell 7 more. Thursday's operations were similar; and Gaslight "A" touched 234. On Friday there was a check, and Gaslight "A" was less offered; so that the quotations recovered 2. Other stocks dealt in were steady generally. Chelsea Water advanced 2; and East London, 1. Saturday was more than usually active; and several transactions were marked in Gaslight "A"—prices ranging between 239 and 240. Quotations throughout were unchanged.

ELECTRIC LIGHTING MEMORANDA.

The Affairs of the Westinghouse Company—Candle Power and Illumination—Quantity versus Quality in the Electrical Industries.

MUCH interest, not in all cases of a kindly sort, is taken by those connected with the electric lighting industry of the United States in the condition of the Westinghouse Company, who are reported to have come to grief through over-trading. If this concern should survive its difficulties, it will be through the personal assistance of its founder, Mr. George Westinghouse, jun., who will accordingly have to devote to the salvation of his electric lighting interest a considerable share of the resources he has created by his success as a mechanical engineer. The Westinghouse electric lighting system has been frequently discussed in the JOURNAL. It was the first practical development of the Gaulard-Gibbs method of transforming alternating currents of high potential into currents that may with some approach to safety be introduced into houses; and the Ferranti system is but an exaggeration of it. In effect, Mr. Westinghouse has made himself the apostle of the alternating transformer system, both in America and in England. The Company which he formed to carry out his system tried to monopolize all the town lighting in the States. At one time their programme was to work with the gas companies—supplying electricity for light, and substituting a cheaper kind of gas for fuel purposes. The problem that has baffled so many other men of an inventive turn was, however, too much even for Mr. Westinghouse. After prolonged efforts, and heavy outlay upon fruitless experiments, Mr. Westinghouse was obliged to confess that the *ignis fatuus* of cheap fuel gas had escaped him. This was two or three years ago; and since then the Westinghouse electric lighting system has not justified the extravagant hopes that were entertained respecting it. Notwithstanding enormous outlay in securing business after the American style—that is, by paying exorbitant commission to agents and middlemen, and by buying over everybody who could influence an order for plant—the Westinghouse Company failed to secure that command of the native market at which they were understood to aim. At the present time the Westinghouse system is reputed to be in operation at less than 350 central lighting stations in America, while the Thomson-Houston Company are credited with upwards of 660 public lighting plants. From whatever cause the effect really proceeds, however, there is no doubt that the Westinghouse Company are in a poor way; and they have figured too prominently before the world as a representative electric lighting firm to escape being used to "point the moral" in the comments of observers who have never seen anything genuine in the expansive American electric lighting industry.

The electricians, or at least a party among them, take the proved defects of the incandescent lamp, which have been repeatedly discussed in this column, very seriously to heart. The difficulty of obtaining really satisfactory lighting by means of this kind of lamp, unless nominal candle powers out of all reasonable proportion to the work to be done are used, has raised the old controversy about the existence of a difference between photometrical results and practical lighting effect. Sir David Salomons recently said at the Institution of Civil Engineers that, whatever might be argued to the contrary from photometrical tests, it is advisable to employ frosted or obscured globes for incandescent electric lamps, because otherwise the filament has too little diffusive power. Following upon this, the *Electrical Review* appears to encourage the idea that a source of artificial light may possess intensity but not diffusive power, and invites discussion on the subject. The point has, in reality, been discussed many times; but without establishing any real difference between light intensity and lighting. The question cannot be properly broached in this way. It is open to the photometrist to argue that since it is only the equality of the lighting of two surfaces by different sources of light that he takes into account, it is, in effect, diffused light that he measures. He does not look at the lights themselves, but only at a reflecting surface exposed to their rays; and as it is immaterial whether or not this surface is placed at any particular bearing from the light it reflects, the light must be radiated in a spherical sense. How there can be any greater diffusion than this, is hard to conceive. The question is rather that of lamp *versus* pharos. Do we want to see the light-source, or to see something by its rays? If the former, the more intense it is—that is, the greater the difference between the brilliance of the light and the darkness through which it shines—the more effective it will

appear to the eye. If it is not a light, but lighting, that is desired, the closer the approximation between the lamp and its surroundings, the clearer will be the power of sight. A statutory "London" Argand gas-burner in a dark room, for example, does not look the same thing as a precisely similar burner in an apartment of equal size with whitened ceiling and light-coloured walls. Would an incandescent lamp radiate more light if it were rapidly vibrated so as to make its loop appear to the eye to occupy the space of an ordinary flat-flame gas-burner? It is more reasonable to suppose that the incandescent lamp does not radiate well, simply because it has not the illuminating power ascribed to it.

It is necessary, when matters electrical are being discussed, to keep a sharp look-out for the true meaning of the language used to describe the progress, advantage, or other debateable quality of electrical science and practice. For example, *La Lumière Electrique*, in its scientific and technical review of the events of 1890, makes the statement that with regard to general progress in the industrial applications of electricity, America is "a long way in the van; more particularly with regard to electric lighting and the use of electrical tramways." As to the latter, it is pointed out that, whereas in the United States there is scarcely a town which does not possess its electrical railway or tramway, it may be said that in Europe this method of propulsion is practically non-existent. This is the sort of talk that electricians like to indulge in, and which the great American public seem to regard as grateful flattery. Anybody might imagine, after hearing such a statament, that there is something in the air of America peculiarily favourable to the development of high-class electricity, which cannot be cultivated so well elsewhere. The truth is, of course, that America being "in the van" in this respect simply means that it will endure what is politely called electrical engineering of a brand that no self-respecting European country would tolerate for a day. France might be "in the van" also if its urban authorities understood their responsibilities in the free-and-easy fashion of the United States town governments. There is no difficulty in having a "plenty," if one does not mind of what it is to consist. People may be in a "van" on the way to the Bankruptcy Court; but this is not, as a rule, a progress which excites admiration for its rapidity alone.

THE GLASGOW CATASTROPHE EXPLAINED.

THE very precise, comprehensive, and conclusive opinion with reference to the cause of the Dawsholm gasholder catastrophe which is expressed in the report of the experts called in by the Glasgow Corporation Gas Committee, happily puts this deplorable occurrence into the category of explainable disasters. Writing from the spot just before the presentation of the report, our local correspondent was able to give to readers of last week's JOURNAL a very clear indication of the nature of the proximate cause of the destruction of the two holders. The experts—Sir W. Arrol, Mr. G. Livesey, Mr. C. Hunt, and Mr. A. Gillespie—unanimously agreed that "there was no explosive mixture in the gasholders, and that the accident was not due to any defect in the gasholders or in their working." They further reported that there was evidence of an explosive material having been placed on the crown of No. 2 holder, which made a hole inwards and lighted the gas. The concussion of the initial explosion must have ripped open No. 2 holder, and the shock caused by the ignition of the gas of the latter was sufficient to rupture the sheets of No. 1 holder, whereby the contents of both escaped and were ignited—the gas burning with no more violence than was to be expected in the circumstances. The report in question appears in full elsewhere to-day. The engineering statement will probably be followed by a Home Office report upon the explosion, from the officials sent to the scene for the purpose—Colonel Ford, R.E., and Dr. Dupré, F.R.S.—both of whom are concerned with the administration of the Explosives Act; and when this communication is published, the world will know as much as it is ever likely to learn about this extraordinary affair. Nor is it probable that the official report in question will do more than confirm the supposition that it was dynamite or something similar that did the mischief.

Meanwhile, it is highly desirable that those responsible for the safe working of gasholders everywhere should be assured both of the exceptional and the intelligible nature of the Dawsholm catastrophe. It is not a pleasant subject for reflection that a couple of large gasholders have been found capable of destruction at the hands of a determined dynamiter; but then, it is equally certain that as little trouble would be experienced in wrecking a train on any line in the kingdom. Glasgow has been passing through the throes of a severe labour agitation of late, and the workmen have been getting the worst of it. It has a proportion of perhaps the most turbulent and lawless population of any city in the United Kingdom; and the Corporation have been getting into bad odour with this class of the people on account of the success with which they managed to protect their gas undertaking from the more obvious disadvantages of coaling in the midst of a railway strike. Moreover, it is just about six weeks since the men who were sentenced to penal servitude for the last dynamite outrage on the gas-works were set at liberty. There is thus little difficulty in understanding why the second and more successful attempt of the kind was made at this juncture.

The gasholders at Dawsholm are three in number, placed close together in line in a rather lonely spot, commanded by a railway viaduct. They are sixteen or seventeen years old, being telescopic from the first until more storeage capacity was needed in 1889. In this year No. 1 holder of the group was enlarged by the addition of a third lift, which was done in the usual manner by Messrs. Clayton, Son, and Co., of Hunslet. The original top lift was cut to make the new inside lift—a new curb and sides being fitted to it; and the same crown used. This was a very successful job; and the holder thus tripled worked without a hitch for 15 months—a satisfactory proof of its soundness and strength. Indeed, the construction of the holders was what would be considered particularly strong. The top curbs were of the pattern identified with the name of Mr. V. Wyatt—no angle-iron, but a strong curved plate joining dome and sides, its lower edge strengthened by a stout horizontal plate girder, about 18 inches wide. The crown was trussed, with a long centre post; the sheeting being attached to the trussing at the centre-plate, which was ¼ inch thick. The ordinary crown sheets were No. 11 B.W.G., with stouter plates next the curb and crown plate. Last summer a second holder (No. 2) was tripled in exactly the same way; and nobody suspected it of any sort of weakness. Neither, without dynamite or some other high explosive, would any disaster have been likely to happen to it until the whole structure crumbled with old age. Dynamite, however, upsets all calculations. The third holder, it may be remarked, has remained a double-lift only; and this one is still working satisfactorily.

What happened is narrated as follows: It was twilight on the afternoon of the 15th ult. when the valve-man went to the holder yard. No. 1 gasholder, fully cupped and then 70 feet up, was on the town; No. 3, also cupped, was taking the make; and he opened the inlet of No. 2. This holder was also fully cupped, but was not quite so high as its neighbour, separated from it by about 25 feet space. No. 2 holder then began to work back into No. 3—the double lift—which it could, of course, fill by its superior pressure. The valve-man hurried to shut the valve of the double-lift when the gathering darkness was dispelled by a roar of flame from the sides and top of No. 2 holder, which seemed to burst open at all points. The man, whose steadiness and courage deserve all praise, did not lose his head; but, shielding himself as best he could with his coat, made a dash for the valve. Before he could take many steps, however, there was a second flash and roar, and No. 1 was seen to be on fire likewise. Mr. Wilson, the Station Superintendant, was at the moment in his office, a few hundred yards away, and caught sight of the first glare through the window. He rushed into the yard; but saw the second ignition just as he reached the door. Other accounts confirm this statement of the quick succession of the two ignitions. Mr. Wilson ran to the valves (by which time, of course, the holders were down, and the gas flaming from the pipes), and shut them off. This was a very hot job; the valves being close to the fire. So quickly was all this done that the remaining double-lift holder took up the work of supplying the town within five minutes of the interruption of the service. Consumers at a distance, who did not happen to see the glare, or misunderstood it, imagined, when their gas-lights went out, that there was something wrong with the meter. But by the time they had looked at their meters, and found them all right, the gas would light again as usual.

Next day, when the wreck could be seen, it presented a startling sight. The crowns of the holders were torn off in huge radial rents from centre plate to curb; some pieces lying crumpled in the water, others hanging on the guide-framing. The latter was damaged in parts by the evident jamming of the top rollers against it—in one place a column guide being actually punched right through by the wheel at the height of its bearing when the dynamite took effect. A surge of the water in the tanks had overflowed, from the reaction of the explosion, and left its signs round the coping. The trussing was broken up. When the water was lowered, the extent of the damage to the sides of the holders was disclosed. All the lifts were more or less rent; many rivet-heads being scattered on the ground. The grass and everything combustible round bore traces of the fierce flames which spread far and wide for the moment. Witnesses from a distance saw a huge cloud of smoke rise into the sky, showing that the air could not rush in quick enough to ignite all the gas; while some observers still farther off describe the sight as of a huge ball of fire rising over the spot.

Only one hole made by the explosive, whatever it was, has been found, and this was in one of the ordinary crown sheets, at a little distance inward from the curb, and near one of the principal bars. Curiously enough, no rent started from this hole, which preserves the incurving edges, and the chemical stains, that disclose the nature of the damage. We may suppose that the iron had been made exceptionally brittle by the frost, or a thousand things; but the extent of the ravage will remain inexplicable. One cannot help thinking that there must have existed at that particular instant of time a combination of circumstances which enabled the miscreant who planned the deed to "do better

than he knew;" for it is hardly too much to say that, under ordinary conditions, a gasholder in work might be punched all over with holes, whether by means of dynamite or live shells (as was done during the siege of Paris), without worse results than the destruction of a plate or two and the loss of the gas.

DRAFT PROVISIONAL ORDERS FOR 1891.

THE following Draft Provisional Orders have been deposited with the Board of Trade, in accordance with the requirements of the Gas and Water Works Facilities Act, 1870.

The Bramley District Gas and Water Order is to authorize a Company, with a gas capital of £15,000 and power to borrow £3750, to construct gas and water works for the supply of the district named, in the county of Surrey. Gas of 15-candle power is to be supplied, with 6s. per 1000 cubic feet as the initial price under the sliding scale. Separate accounts are to be kept of the gas undertaking. The Company's water capital is to be £10,000, with power to borrow £2500. The source of supply is to be a well and pumping station in Wonersh parish. Rates for domestic supplies are to range from 8 to 6 per cent. The Cirencester Gas Order is to authorize the limited Company to maintain and continue their works for supplying gas in a district comprising the parishes of Cirencester and Stratton, both in Gloucestershire. The statutory capital of the undertakers is to be £30,000, whereof £20,000 is to be the already expended original capital, with borrowing powers in the proportion of one-fourth of the amount of the paid-up capital. Additional land is to be acquired. Gas of 15-candle power is to be supplied at the initial price of 4s. 9d. per 1000 cubic feet. The Cirencester Water Order is to give authority to the limited Company to maintain and continue their water-works for supplying the parishes of Cirencester, Stratton, and Coates, all in Gloucestershire. The capital of £10,000 is to be increased to £16,000, with power to borrow £4000. The existing water-works comprise a well and pumping station and the usual accessories situated in the parish of Cirencester. Rates for domestic supply are to range from 10 to 7 per cent. The Corsham Water Order is for the purpose of enabling the Corsham Water-Works Company Limited, to raise £2000 of new capital and to borrow £1500. The Godstone District Gas Order is to sanction the construction of gas-works for the supply of this neighbourhood of the county of Surrey. The capital of the Company is to be £10,000, with power to borrow one-fourth of this amount. Gas of 15-candle power is to be supplied at the initial price of 5s. 6d. per 1000 cubic feet. The Matlock Water Order is to enable the Company to raise £12,440 in addition to their existing capital of £7560, and to exercise the usual borrowing powers. The Matlock and District Gas Order is to enable the established Company to continue to supply gas in Matlock and several neighbouring parishes. The capital of the undertakers is to be £36,000, of which £19,600 is the original capital of the Company, with the usual borrowing powers. Additional land is to be purchased; and 15-candle gas is to be supplied at an initial price of 4s. 6d. per 1000 cubic feet. The North Sussex Water Order is to authorize Messrs. L. F. and S. J. Palmer to construct works for the supply of water in a portion of the parish of Worth, in Sussex, with a special capital of £20,000 and the usual borrowing powers. The works will consist of a well and pumping station and the usual accessories. Rates for domestic supplies are to range from 10 to 7 per cent.; such rates to be alterable after six years by the Board of Trade, upon the application of any local authority having jurisdiction within the limits of supply. The Seaton and Beer Water Order is to authorize the maintenance and continuance of existing water-works and the construction of new works for the better supply of the district named, in Devonshire. The Hon. Mark Rolle, Sir George Stucley-Stucley, and the Right Hon. Sir Massey Lopes, as Trustees under the will of the late Lord Rolle, are the undertakers, whose capital is not to exceed the sum of £5000. The existing water-works comprise a collecting tank, an interchange tank, and the necessary subsidiary works, which are to be enlarged by a service reservoir and pipe line. Rates for domestic supplies are to be either 6, 5½, or 5 per cent. on rental. Permission is sought to supply any consumer by meter, at the undertakers' option. The Staines and Egham Gas Order is to extend the limits of supply by the Company to parts of the parishes of Ashford and Stanwell. The Southborough Gas Order is to empower the established Company to raise £4000 of additional capital (the original capital being of the same amount), with the usual borrowing powers. Interest on borrowed money is to be limited to 6 per cent. The qualification of Directors is to be fixed at a £25 holding; and the scale of voting is to be settled. Gas of 15-candle power is to be supplied at the initial price of 5s. per 1000 cubic feet. Authority is desired to sell the undertaking upon terms to be agreed upon. The South-East Essex Water Order is to authorize a new Company to construct works and supply water in a district comprising the parishes of Rayleigh, Thundersley, Hadleigh, Leigh, Hockley, Hawkwell, and Rochford. The capital is to be £20,000, with power to borrow the usual proportion. The source of supply is to be a well and pumping station in the parish of Rayleigh. Rates for domestic supplies are to range from 10 to 7 per cent. The Swaffham Water Order is to authorize the continuance of the existing undertaking, with a capital of £4000, of which £3000 is original capital, with the usual borrowing powers. The supply is from a well and pumping station in Swaffham parish. The rate for all domestic supplies is to be 8 per cent. The Woking District Gas Order is to sanction the construction of gas-works for the supply of the district named, in Surrey. The capital of the Company is to be £20,000, with the usual borrowing powers. Gas of 14-candle power is to be supplied at the maximum price of 5s. 6d. per 1000 cubic feet.

The following are Provisional Orders for which application has been made to the Local Government Board:—

The Borough of Richmond (Yorkshire) Order is to vest the gas undertaking of the Municipal Authority in the Sanitary Authority, who are to supply 15-candle gas at the maximum price of 6s. per 1000 cubic feet. A debt of £1319 is to be paid off. No gas profits are to be carried to the credit of the borough fund when the price of gas exceeds 5s. per 1000 cubic feet. The public lamps are to be metered in the proportion of one in twelve; and the price charged for their gas is not to be more than 10 per cent. less than that charged to private consumers. The Salford Corporation Gas Order is to enable the Corporation to acquire additional gas lands. The Selby Local Government District Gas Order is to authorize the Local Board to carry on gas supply from existing works, and to borrow £20,500 for the purpose. Gas of 15-candle power is to be supplied at the maximum price of 6s. per 1000 cubic feet, with permission to grant rebates of not exceeding 20 per cent. No gas profits are to be carried to the credit of the district fund when the charge to private consumers exceeds 4s. per 1000 cubic feet. The price of gas charged to the public lighting account is not to be less than 2s. per 1000 cubic feet.

NOTES.

The Use of Gas in Ventilation.

One of the latest examples of the use of gas to assist ventilation is Messrs. Barclay, Bevan, and Co.'s bank premises in the City. Here the work has been done according to the plans of Mr. D. G. Hoey, under the superintendence of Mr. J. T. Lee, the Architect to the firm. The *Builder* remarks that the work is "notable for great care and attention to detail rather than for any remarkable novelty of arrangement." The large room of the bank has a content of about 175,000 cubic feet, and accommodates usually 175 people. Its atmosphere can be renewed on an average 1½ times an hour, by means of a foul-air extracting shaft, having an area of 20 square feet, and rising to a height of 90 feet from the ground. This shaft is made with hollow walls, to avoid chilling the contents and so causing down-draught; and it is fitted at the top with a strong and freely-revolving lobster-back cowl, to prevent wind blowing down. The opening from the room into the foul-air shaft can be closed by a wire-gauze shutter, to lessen the velocity of the current, if desired; while if it is required to increase the power of the shaft, atmospheric gas-burners are so disposed as to heat iron plates running up the shaft to a height of 12 feet, and so dividing it into heated vertical sections discharging into the common outlets. The openings for admitting fresh air are caused to lead the current over low-pressure hot-water pipes, which warm it in winter, after which it enters the room in numerous and finely-divided streams. Analyses of the air of the bank would be needed to prove the working of this arrangement.

Electric Photometry.

A communication bearing upon the question of photometry by electricity has been sent to the *Electrical Review* by Mr. Rollo Appleyard, of Cooper's Hill College. The writer remarks that some years ago M. Becquerel published an account of experiments carried on by him regarding the action of light upon silver plates coated with bromide, iodide, chloride, and other silver salts, and showed it to be possible in some degree to obtain an electrical equivalent for actinic radiations cast upon these surfaces. The next discovery of importance in this branch of electrical science was that of the varying electrical resistance of selenium under exposure to light, the practical outcome of which was the ingenious photophone of Graham-Bell. From the date of these experiments, little more has been achieved in the field of photo-electricity. Recently, however, another chapter in the history of this interesting branch of scientific research has been opened by the publication of Professor George M. Minchin's results of work in this direction, which has extended over fourteen years. He has devised several new kinds of cells; the latest giving an electro-motive force of more than 0·5 volt when exposed to ordinary diffused daylight, which is distinguished as a "seleno-aluminium cell." Another cell, made with tinfoil, is externally similar to this one, but possesses a remarkable, and indeed paradoxical quality, in virtue of which it is known as an "impulsion cell." Mr. Appleyard gives minute instructions for making the seleno-aluminium cell and mounting it for use. On exposure to light, the sensitized plate is negative towards another aluminium plate, developing considerable electro-motive force for every region of the spectrum, but with the maximum in the yellow. For instance, the diffused light of one of the recent foggy days gave with one of these cells a force of about 0·25 volt. This cell differs from

all other photo-electric cells in this sensitiveness to yellow light' as well as to other parts of the spectrum; almost all others confining their action to the blue. It is this characteristic of being sensitive to light, and not merely to actinic energy, that makes the new cell an approximation to an electrical photometer. The tinfoil cell upon exposure to light may not exhibit any electromotive force at all to begin with; but a slight tap on the support of the cell will make it act, another causing it to revert to the insensitive state, and so on. According to Professor Minchin, the objects to be attained by photo-electricity are threefold—first, the construction of an electric photometer which will enable us to compare in a rational manner the intensities of different lights as regards each of their individual colours; secondly, "seeing at a distance by means of electricity;" and, thirdly, the utilization of solar energy for the purpose of doing work without the consumption of terrestrial materials. The usual objection to the last project is that there is not sufficient energy in the solar rays received at the earth's surface; but Professor Minchin denies this assertion, which he says is based on inconclusive experiments.

A New Anti-Corrosive Paint.

A new recipe for preparing an anti-corrosion paint for gas-holders, ships, and exposed structural ironwork in general, is given by Messrs. Philip Helbig and Hermann Bertling, of Baltimore, U.S.A., who claim to be inventors of the process. It consists in subjecting pure cotton-seed oil—consumed in this country more as an adulterant of olive oil and of lard than in its natural state—to the repeated action of showers of molten lead. The prescription is 20 lbs. of pure metallic lead to 1 gallon of the oil, which is to be carefully melted, and in this condition slowly poured into the oil; the latter being continually stirred during this process. The inventors state that by this means a part of the lead will become actually absorbed by the oil; so that after both materials have been permitted to cool together, only 17 lbs. weight of the metal is recoverable. This is now re-melted and again poured into the same oil, which is credited with power to absorb 2 lbs. more of the lead. Five times is this operation repeated, until (as it is stated) 10 lbs. of lead have been absorbed by the original gallon of oil; after which it will not take up any more. At this stage the oil cools to the consistency of ordinary paint; and it can be applied to iron or woodwork with a brush in the usual manner. It is described as being highly adhesive, and as drying sufficiently in 48 hours to receive a second coat. The inventors declare that no other oil similarly treated has the same property of absorbing lead; but, unfortunately, no chemical analysis of the product is offered in proof of the assertion that the molten lead vanishes into the cotton-seed oil, and is not lost in other ways.

Death of Mr. J. C. Foster, of Rochester.—The death is announced, at the age of 82 years, of Mr. J. C. Foster, of Rochester. The deceased gentleman occupied, almost from the time of its formation, the position of a Director of the Rochester, Chatham, and Strood Water-Works Company, in which capacity he earned the deep respect of his colleagues on the Board.

Gas-Engines in Spain.—The Madrid Correspondent of *Industries* says the German company who manufacture gas-engines of the "Otto" type are trying to extend their use in Spain. The Company supply them, together with the means of making some special gas for their working; and they estimate that the expenditure of fuel will be 1 kilogramme per horse power per hour. This, he says, seems to show that the gas is not Dowson's, which has been used in only one instance in Spain. Anthracite is found in the Asturias, which can be easily worked; and gas coke is sold at Cadiz and Xerez at a lower price than that of coal.

Southern District Association of Gas Engineers and Managers.—The annual meeting of this Association will be held at the Holborn Restaurant on the 12th inst., when the President (Mr. John Methven, of Nine Elms) will deliver his Inaugural Address. According to the programme of business issued by the Honorary Secretary (Mr. J. W. Helps), the Committee will present their report of the past year's proceedings, and propose an alteration in the rules, so as to constitute the Past-Presidents Vice-Presidents and *ex-officio* members of Committee for seven years after the completion of their year of office. At the close of the meeting the members and friends will dine together.

Gas v. Electricity for Lighting Open Spaces.—In a communication lately presented to the Société Industrielle du Nord de la France, M. Melon gave some comparative figures as to the cost of lighting two open spaces in Lille—the Place de la République and the Place de Sébastopol—by gas and electricity. At present these squares are illuminated up to midnight by improved flat-flame burners, at a cost to the city of 3900 frs. per annum. The project submitted to the Municipality for lighting them by electricity showed an annual expense of 19,188 frs.; but the light furnished would, it must be acknowledged, be three times as great. M. Melon estimated that, by substituting newer types of burners for those now employed, an equal amount of illumination to that which would be afforded by electricity could be obtained for 8190 frs. per annum. So that, for equal lighting, electricity would be from two to three times as costly as gas.

TECHNICAL RECORD.

INSTITUTION OF MECHANICAL ENGINEERS.

The Forty-fourth Annual Meeting of this Institution was held on Thursday and Friday evenings last week, at the Institution of Civil Engineers, Great George Street, Westminster, under the presidency of Mr. JOSEPH TOMLINSON. There was a numerous attendance of members.

The customary business of the annual meeting was disposed of at the commencement of the proceedings on Thursday. The minutes of the summer meeting were read, and confirmed; and then the report of the Council on the progress of the Institution during the past year was submitted. This showed that at the end of last year the number of names of all classes on the roll of the Institution was 1945, as compared with 1858, at the close of the previous year; showing a gain of 87. During the year, there were added to the register 160 names, against which the loss by deceases was 31, and by resignation or removal 42. The additions to the list of members included the name of H.R.H. the Prince of Wales, with whose consent the Council had the honour of electing him an Honorary Life Member in appreciation of the interest he had at all times manifested, and the official consideration and recognition he had bestowed, in connection with the work of mechanical engineers, as recently exemplified by his opening the Forth Bridge—the latest triumph of mechanical engineering. With regard to the accounts, the receipts amounted to £6784; while the expenditure, actual and estimated, was £5738—leaving a balance of receipts over disbursements of £1046. The total investments and other assets amounted to £34,308; and allowing £600 for accounts owing, but not yet rendered, the capital of the Institution stands at £33,708, of which the greater part is invested in railway debenture stocks. Among the receipts for the year was included the repayment of the corporation duty for the three years 1885-86 to 1888, amounting to £70 13s. 8d. The payment of this amount, claimed under the Customs and Inland Revenue Act 1885, was made by the Institution in 1887 under notice of appeal; and pending the settlement of the appeal then already made by the Institution of Civil Engineers, the payments for the subsequent years had, the report stated, remained in abeyance. Consequent upon the final decision of the House of Lords, given on Aug. 1 last year, the above payment had now been refunded by the Board of Inland Revenue. While congratulating the members upon this result, the Council were sure that the members would join with them in cordial congratulations to the Institution of Civil Engineers upon this favourable termination of a suit so long pending. The report having been adopted, the result of the ballot for the election of office-bearers was announced. Mr. Tomlinson, it was found, had been selected to fill the chair for another year; and this met with the marked approval of the members. Mr. A. M'Lean was re-elected auditor. A very cordial invitation to the Institution to hold their summer meeting this year in Liverpool was read from the Mayor of Liverpool; and the President stated that it had been accepted by the Council. A long and animated discussion ensued on the following motion, proposed by Mr. J. Macfarlane Gray: "When the total annual subscriptions paid by any member amount to thirty annual subscriptions of £3 each, he shall thereafter be declared a life member of the Institution, entitled to all the benefits of membership without any further payment to the Institution." On the vote being taken, this was negatived by a large majority. The business on Thursday evening concluded with the reading of a paper by Mr. Bernard Dawson, of Malvern, on "Some Different Forms of Gas-Furnaces." An abstract of this paper and of the discussion (which was taken on Friday evening) is given below. The other business on the *agenda* for Friday was a paper, by Mr. Walter Bagshaw, on the mechanical treatment of moulding sand, and a report dealing with some experiments by the Research Committee on the friction of a pivot bearing.

SOME DIFFERENT KINDS OF GAS-FURNACES.

The paper by Mr. BERNARD DAWSON, referred to above, was very lengthy; but the subject dealt with is a wide one, and the author, it was evident, had endeavoured to describe as briefly as possible the many forms of gas-furnaces in existence. The following are some extracts from the paper:—

The greater number of gas-furnaces in which crude heating gas has been successfully applied have been of the kind now universally known as reversing regenerative furnaces. There are many processes, however—requiring various degrees of temperature below that which can be maintained with any regularity by the use of regenerators only of the kind associated with the name of Sir William Siemens—in which gas furnaces have been used with some degree of success, both as regards economy in quantity and quality of fuel consumed to do a given quantity of work, and also as regards increased speed of work, saving in wear or destruction of the furnaces themselves, saving in labour, abolition of smoke, and the certainty of being able to maintain an atmosphere or flame either of a reducing or of an oxidizing nature; the two latter being essential conditions in many manufacturing processes. In large works it is often a further great advantage to be able to concentrate in one

place the manipulation of all the fuel required in the various furnaces scattered throughout the different departments or shops, as also to avoid the nuisance arising from having to clean the fires and to remove the ashes. It is therefore at times a distinct advantage to employ gas for heating furnaces in which the saving in cost of fuel is itself a secondary or comparatively unimportant matter. The exact point at which it is advantageous to dispense with the somewhat costly system of reversing regenerative chambers is one on which there is some diversity of opinion. There are, of course, many furnaces, which can be and are being heated by gas, in which the temperature required is not high enough to render reversing regeneration either economical or even advisable. It is probable, however, that the many comparatively low-temperature gas-furnaces, to which such regeneration has been successfully applied at the new locomotive works of the Lancashire and Yorkshire Railway at Horwich, may lead to this form of furnace being more generally adopted in future for such work as annealing steel castings, heating plates and angle-bars for locomotive and marine boiler work, and for shipyards, where a uniform temperature all over a large plate is required for flanging or bending. On the other hand, there are many furnaces in which the higher temperature required is such as cannot be attained by the combustion of producer gas with cold air, but in which, with air heated in flues by radiation or conduction from the bed of the furnace and from the flues leading from the furnace to the chimney, a satisfactory result is attained, with some saving in first cost in building the furnace, and without the necessity for much excavation below the bed or hearth of the furnace. The use of gas with cold air is necessarily wasteful, owing to the inability to recover the waste heat from the flame or products of combustion before they pass away to the chimney; and this waste may be prevented by the employment of what may be termed continuous, as opposed to reversing, regeneration. In furnaces of this kind, as also in those with reversing regeneration, care must be taken to ensure that the escaping gases or waste heat shall pass into the chimney flues at a sufficiently high temperature to secure the amount of draught requisite for working the furnace advantageously. Unfortunately designs for gas-furnaces of different kinds, both regenerative and non-regenerative, and with various forms of continuous regeneration, have been proposed to manufacturers, and carried out by them in ignorance of the true principles of combustion of gaseous fuel; and the author has known some egregious and costly failures with experimental and untried furnaces for various special processes during the last ten or eleven years that he has been engaged in this class of work. Some of these furnaces, by attention to the bad results attained and study of the causes, have ultimately been made to succeed. Others, either from inability to rectify them or from disinclination of their users to spend money upon further trials, have been abandoned. In many cases where the level of the land on which the furnaces are built, the presence of water below the ground line, and other local circumstances, preclude the use of underground reversing regenerators, continuous regeneration has been successfully adopted.

Gas-furnaces may properly be divided into four classes—(*a*) With reversing regeneration; (*b*) with continuous regeneration; (*c*) non-regenerative; and (*d*) with blow-pipe or forced blast. (*a*) Furnaces with reversing regeneration are of several different kinds: (1) The ordinary Siemens furnace, in which both gas and air are heated before admission to the interior of the furnace, by being passed through the well-known arrangement of brick chambers filled with chequer-work or loosely piled bricks. (2) The Batho or Hilton furnace, in which the regenerative chambers, instead of being partly or entirely underground, are encased in cylindrical wrought-iron vessels erected upon the ground level. (3) Furnaces in which the air only is regenerated by being passed through chambers; the gas being admitted direct from the flues by which it arrives from the producers. In these furnaces the whole of the escaping gases or waste heat has to pass through one of the two air-chambers on its way to the chimney. (4) The furnace described by Mr. Head before the Iron and Steel Institute at their 1889 meeting, in which a portion of the waste heat is taken back to the gas producer. (5) The various regenerative blast-furnace stoves of the Cowper, Whitwell, and other kinds. (*b*) In furnaces with continuous regeneration, the air, before admission to the interior of the furnace, is heated in flues or pipes, by radiation or conduction from the bottom of the furnace, and through thin walls which separate the air-flues from the flues that carry the spent gases or waste heat to the chimney. (*c*) In non-regenerative furnaces the air is admitted to the interior of the furnace at its natural or atmospheric temperature. (*d*) Blow-pipe or forced-blast furnaces are of two kinds—Firstly, those in which the air is supplied at its natural or atmospheric temperature by a fan or blower; secondly, those in which the air so supplied is heated by the spent gases or waste heat from the furnace, by being passed either through coils or stacks of pipes, or else through brick tubes or flues, as with the Radcliffe furnace and others.

Furnaces with reversing regenerators for both air and gas have been built principally for such high temperatures as are required for melting steel, copper, nickel, zinc, and glass; for heating iron piles and steel ingots; for forging furnaces, and heating furnaces in connection with stamping and flanging presses; for tire furnaces, tube welding, heating gas-works retorts, burning pottery and bricks, and so forth. Continuous regeneration furnaces are used for muffles, low-temperature annealers, furnaces for close and open annealing of sheet iron and tin plates, of brass and copper tubes, cartridge cases, and wire. Non-regenerative furnaces are used for such low temperatures as are employed for evaporating brine, for boiling and distilling oil and tar, brewing pale ale, drying slurry in cement works, drying foundry cores and moulds, revivifying charcoal in sugar works, and burning carbon for electric-light purposes. Also for firing steam-boilers of all kinds; for heating revolving and other furnaces at chemical works, black-ash and sulphate of soda furnaces; for evaporating waste leys and clack liquor in paper mills; for roasting and calcining ores; and for many other industrial purposes too numerous to recapitulate. Blow-pipe furnaces, into which heated air required for combustion is delivered under pressure, have been used for puddling iron, melting brass in pots, heating plates for stamping into railway sleepers, melting zinc ores, welding tubes, &c. But with the exception of some few puddling furnaces on the Continent, the author believes that this application of producer gas has not yet been carried to a success.

The failure of some non-regenerative furnaces may be attributed to losing sight of the different specific gravities of hot producer-gas and cold air; and also to neglecting to impart to the air, before it meets and mixes with the gas, some impetus or motion in the same direction in which the gas is travelling on its entrance into the furnace. For instance, where cold air is admitted in a horizontal stream over the gas which is rising vertically or obliquely from the gas-valve, intimate mixture and perfect combustion are rarely attained; in addition to which, small explosions and other troubles are frequently experienced. In other cases the introduction of the gas and cold air into the furnace in parallel streams, or in any large volumes, either side by side or over one another, has led to failure. In furnaces to be heated by gas and cold air, either the volume of each should be split up into a number of small streams by perforations in the walls forming the inlet to the furnace; or else some form of combustion chamber should be provided, in which the gas and air can be mixed and partially ignited before admission into the actual furnace itself. The regulation of the pull or draught of the chimney on the furnace—so as to draw in just sufficient cold air for burning the gas, without drawing unburnt gas into the chimney—although often neglected by the furnace-men, can easily be effected with a little care, provided that the respective sectional areas of the gas and air inlets and of the outlet to the chimney have been duly considered in building the furnace.

The principles and construction of furnaces with reversing regenerators for both gas and air are now much better and more generally understood than was the case only a few years ago. It is curious, however, to what a small extent gas crucible furnaces have been substituted for the old furnaces or "coke holes" in which the greater part of the crucible steel melted in Sheffield is still made. The many objections heard from time to time, as to inability to keep a mellow heat or regulate the heat and the draught, are such as can certainly be overcome. There may, however, be other objections and difficulties, with which only those actually engaged in steel melting are acquainted. With so many different means of attaining and regulating the temperature in gas-furnaces, and with such perfect control over the admission of gas and air over the chimney draught, there are few industrial processes requiring heat to which producer gas ought not to be capable of being advantageously applied. The question of extra first cost in the erection of new furnaces, and the impossibility of applying gas to existing coal-fired furnaces with any degree of success, have very much prevented the extension of gas-firing; although the erroneous ideas prevalent as to the necessarily complicated nature of gas-furnaces, and as to the cost in repairs and maintenance, have probably done quite as much to prevent many such furnaces from being built. An objection had been raised that, whereas with a coal-fired furnace the furnace-men attend to the fire themselves, with a gas-fired furnace they would not or could not attend also to the gas-producer, which thus entails an extra man. This question of extra labour has not unnaturally been brought forward in connection with various combinations of gas producers and furnaces, as showing the advantage of having the producer attached to its own furnace. The disadvantages of this plan appear to be that, whenever from any reason a furnace has to be stopped, the gas-producer connected with it must stand too—representing so much idle capital, and therefore a greater total expenditure in producers than where (say) a dozen producers are erected all together to supply a number of furnaces of which only a certain proportion are ever at work at the same time. The necessity of having to convey fuel and ashes to and from several furnaces in large works is also a disadvantage in the plan of combined producer and furnace. The loss of heat by radiation in the passage of the gas from the producers to the furnaces is sometimes adduced as an argument in favour of the combined plan; but with properly constructed flues, this is more imaginary than real. Reversing regenerative furnaces are now largely used for melting glass; and in tube works, furnaces with reversing regeneration are used for welding iron tubes for water and gas and steam, although the use of gas-furnaces has not at present extended beyond a few of the largest works.

The application of jets of water gas to welding large tubes, boiler flues, seams of sugar pans, &c., at the Leeds Forge, and

at Messrs. Thomas Piggott and Sons' works at Birmingham, and Messrs. John Brown and Co.'s works at Sheffield, can scarcely be accurately regarded as constituting distinctive furnaces, and therefore admit of no more than passing mention. But Mr. Oakman, the European representative of Mr. B. Loomis, has recently applied water gas, made by this process from small coal, to a crucible-steel furnace, to a furnace for baking clay crucibles, to an annealing furnace for tubes, and to another for tube welding at Messrs. Howell's works in Sheffield. Arrangements are made by which these furnaces can be supplied either entirely with the producer or "bye" gas from the water-gas plant, or with a mixture of this "bye" gas and water gas; the proportions of each being regulated by valves at will. It is to be hoped that before long some information will be furnished as to the comparative cost of fuel and labour, also as to the time saved and the increased output attained by the use of mixed gases, so that the expediency of erecting water-gas plant, in order to make and store two gases separately, and then mix them again before use, may be definitely settled. It is beyond doubt that there are many purposes—such as tube welding, heating bolt and rivet iron, chain welding, and other processes requiring a high local temperature concentrated upon a small surface or upon a small portion only of a large surface—to which ordinary producer gas has never been advantageously applied, and for which pure water gas appears to be very suitable. The Loomis water-gas plant erected by Messrs. Howell is stated by them to be working to their entire satisfaction, and with economy and regularity. Some of these furnaces have continuous regeneration, and others reversing, of the air alone in every case. Similar furnaces are now being erected for making wrought-iron wheels, and for melting steel and glass, to be worked by water gas made from coke, on the principle that is in use, as above mentioned, at the Leeds Forge.

Retorts for making illuminating gas in gas-works have been heated by producer gas made both from small coal and from the coke raked out from the retorts themselves, and have been arranged both with continuous regeneration and reversing regeneration of the air, but have never been extensively adopted. Descriptions of such furnaces have been given by Mr. Foulis, of Glasgow; Mr. Charles Hunt, of Birmingham; Mr. Denny Lane, of Cork; and others. The Klönne and other systems of combined furnaces and gas producers have also been introduced in many large gas-works with success. But to describe them in this paper fully would take too much time and space. A large number of gas-furnaces, principally on a small scale, and applicable to a great variety of purposes, have been invented by Mr. Fletcher, of Warrington; but as far as the author knows, they have been confined to the use of ordinary illuminating gas. There are few industries requiring the intelligent use of purified gas which are not indebted to the patient investigations and experiments of Mr. Fletcher. Mr. Emerson Dowson's various applications of heating gas deserve recognition; and it is to be hoped that at some future date the various types of small gas furnaces, to which these truly belong, will be treated of. In the chemical industries a variety of gas-furnaces have been introduced; and the author believes that before many years have passed, the rising price of fuel must increase the number of chemical and alkali works in which the use of gaseous fuel will have superseded the employment of solid smoke-making coal.

In the course of the paper, a large number of various forms of furnaces for different purposes were described and illustrated by coloured diagrams exhibited in the hall.

The discussion on the paper contained very little matter of interest for JOURNAL readers. Mr. Aspinall was the first speaker; and he referred to a visit which the author of the paper paid to his works some two years ago. At that time they had three furnaces working with continuous regeneration, and were trying them with a view to seeing whether they could not work without regenerative chambers. Since then they had altered two of these furnaces, and put regenerative chambers beneath them. He found that, while the third furnace, used for annealing, did very well with continuous regeneration, he could not in the other cases rely upon getting the continuous flow of gas which was necessary to keep the temperature up to a proper pitch. With regard to firing boilers, he did not think they could hope to get boilers to do well with gas firing unless they were easily driven; if they were hard driven, it was better, he maintained, to fire with coal. Mr. Dobson corroborated these remarks on the question of boiler-firing by gas. He said he had known of some 25 cases where it had invariably been found that, if the boiler was worked up to what would be considered industrially successful in this country, it was pulled to pieces by the excessive action of the flame. Mr. John Head spoke at some length. The first portion of his remarks was directed to showing that it was better, especially in cases where the gas producers were situated some distance from the furnaces, to have four regenerators; to use only two regenerators was not, he held, correct in principle. With reference to the question of burning waste gases in the chimney in order to create sufficient draught, he conceived that to be wrong; the proper remedy being to build a chimney high enough for the purpose. As to the advantage that was supposed to accrue by placing the regenerators at the top of the furnace or round it in boxes, he thought that this was a mere matter of fancy, and that there was no necessity for it. Referring to the new Siemens furnace, he said in this the producer was its regenerator. It had been constructed with two very important advantages—one was that they saved half the cost in construction; and the second was that they saved half the consumption of fuel. Previously the cost of construction had prevented the Siemens furnace being adopted to so large an extent as it should have been; but now that the expense had been reduced to one-half, that disadvantage disappeared. In a short time he believed they would hear of many new applications of the furnace. Mr. Smith Casson remarked that, although he would not say he preferred regenerators placed at the top instead of the bottom of the furnace, he thought that, if Mr. Head saw his (the speaker's) furnaces at work, he would not have any objection to the regenerators being overhead. They obtained very successful results with them. Mr. Alfred Slater testified to the efficiency of a Siemens furnace which had recently been erected on the new plan at the works under his control. Compared with the old furnaces, he experienced a great saving in coal and repairs. Mr. Oakman was then called upon by the President to speak. He said his particular line was in water-gas work; and he had to deal principally with the "bye" gases that they made under the Loomis process. He reminded the members that he read a paper before the Institution last July, in which he described the process he had introduced into the Yorkshire district. Since then he had gone forward with some furnace work in the Sheffield district; and the statements which he made with regard to the application of water gas for crucible steel melting had been more than confirmed. Some furnaces had recently been started for tube welding; and present indications were that the economy in fuel would be something like 40 or 50 per cent. But upon this matter he was not prepared to say anything definite. With regard to continuous producer gas firing, he mentioned that, in using their producer gas, it was done under pressure. The gas was conveyed to a governing holder, and then delivered through pipes to the furnaces at a pressure of 5 inches. With regard to the mixing of water gas and producer gas, his experience led him to the belief that mixed gases were hardly profitable. The discussion was continued by Mr. Read, Mr. Macfarlane Gray, and other gentlemen. Professor Kennedy pointed out that, in the new form of the Siemens furnace, the gaseous fuel was used while it was hot; as it was generated, it flowed direct into the furnaces. If he was not mistaken, it was the view of Dr. Siemens long ago that the gas should be cooled before use; but had he lived to the present day, there was no doubt this opinion would have been modified. Mr. Dawson's reply was mainly upon points which are not touched upon in this brief notice of the discussion. Among other things, he stated that tests had been made which showed that a greater duty could be obtained from boilers fired by gas than from those fired by coal. He added that it was very essential that complete combustion of the gas in the boiler should be ensured before it was allowed to impinge upon the cold tubes.

THE MUNICIPAL OWNERSHIP OF INDUSTRIES.

At the Fourth Annual Meeting of the American Economic Association, recently held in Washington, the subject of the municipal ownership of gas-works in the United States was dealt with in a paper read by Professor E. W. Bemis. On the same occasion, Mr. A. R. Foote was in attendance with a communication on the general question of "The Municipal Ownership of Industries, in which gas undertakings were specially considered;" but he was unable to submit it, owing to want of time. The text has, however, been given in the *American Gaslight Journal*, from which the following abstract has been prepared.

The author commences by remarking that, so far as he is aware, the policy of the municipal ownership of gas-works is advocated by professors of economy on the broad ground that it is a means of securing an economic advantage for society. He presumes professors will agree with him in the general statement that that system of economy is best which most surely tends to enable the poorest member of society to become richer. To reach a solution of this problem, it is necessary to inquire in what way the policy of municipal ownership facilitates this. Two different methods for manifesting the economic advantage to be gained by such ownership are in operation. The first consists in working the plant for the purpose of creating a profit, to be used to reduce taxation for special or general purposes. The second is to conduct the undertaking solely with the object of supplying customers at the actual cost of production. Conceding, for the sake of argument, that the plant is of the most approved kind, and that its operation is carried on under the best possible conditions, Mr. Foote proceeds to consider each of the above-mentioned systems upon its own merits.

Taking first the plan of working a municipal plant for profit, with the view of reducing taxation, the author points out that gas for illuminating or heating purposes is a commodity of consumption, and that therefore the profit made by a municipality on the sale of gas is a tax on consumption. It is self-evident that the higher the price of the gas, the greater the profit will be, up to the taxable limit of the industry. The greater the profit, the

larger the fund to be used for the reduction of special or general taxation. The selling price is the same to all consumers. The profit per 1000 cubic feet on the gas burnt by the poor is exactly the same as that realized on the gas consumed by the rich. Under this system, the poor not only pay the same rate of tax per 1000 cubic feet as the rich, but also consume much more gas per dollar of their income. These two facts, Mr. Foote thinks, fully justify the denunciation of indirect taxation by Professor R. T. Ely in his "Taxation in American States and Cities." This gentleman characterizes indirect taxes as taxes on commodities; and he charges them with obstructing trade, violating the principle of equality, favouring despotism and aristocracy, and leading to pauperism. In view of such teaching as this, says Mr. Foote, one must conclude that the economic results of operating a municipal plant to create a profit tend to make the rich richer and the poor poorer—a result the reverse of that which should be realized by an economic system designed to secure "the greatest good for the greatest number." In this result may be found a logical reason why "the best people" in a community where such a system is in vogue, desire its continuance. Under such conditions any man having a large income can afford to pay twice or three times the price he does for the gas he consumes, since the amount saved to him through the reduction of his taxes by the profit on the gas bills of a thousand other consumers is far greater than his share of the excess of price. This, in the author's opinion, is why the citizens of Philadelphia are paying $1·50 per 1000 cubic feet for gas, when, if the plant were owned and operated as a private industry, the price would be but $1 per 1000. Every wealthy man in Philadelphia has 1000 poor people assisting him to pay the just taxes of wealth. The poor deluded creatures are content to do this, because they think by owning the gas-works they have slipped from under a grinding monopoly. This criticism shows that an apprehension of what really constitutes the economic advantage in any problem is an instinct with the rich, and that if the poor have it at all, it is with them an acquired taste. It further explains why there are two classes of people—the rich and the poor.

Of the two methods of working a municipal gas undertaking considered by the author, he regards the second—where the plant is operated for the supply of consumers at cost price—as the more equitable, as by it the rich gain only the advantage of the saving on the gas they consume, and the gain of the poor is on the same basis. The gas bills of the poor being a larger percentage of their income than are those of the rich, the economic advantage derived by the poor under this method effects a larger percentage of saving for them in proportion to income than it does for the rich. Therefore, this method "tends to enable the poorest member of society to become richer;" and, in fact, obtains "the greatest good for the greatest number." It causes, so far as the economic advantage is concerned, the poor to grow richer and the rich to grow poorer, because it leaves the taxes for the rich to pay. This would be the result of an equitable distribution of wealth.

The author then goes on to show that, if the economic advantage obtained by the community through the price paid for the service is to decide the policy of municipal ownership of industries, then those who advocate private ownership must accept the issue on this basis, and be ready to show that they can, and will, perform the same service for the price that the community pays for it under municipal ownership and administration. In his opinion, a condition precedent to the settlement of this question is an agreement as to what constitutes cost of service under municipal ownership; and then it would have to be seen that these items were included in all statements of cost. When this had been done, people would be in a position to take intelligent action, and could then award the contract to the municipality or to private enterprises, whichever, in the light of the facts obtained, might appear to be to the best economic advantage of the greatest number. Assuming that no economist will join issue with him regarding this fundamental basis for an agreement, he advances one step further, and claims that until such a basis is agreed upon, and the accounts are made in accordance with its requirements, there shall be a suspension of judgment and action. By adhering to this policy, he thinks all parties will not only avoid the liability to get into positions from which they may have to recede when the statements of cost are correctly made, but large invested interests will cease to suffer from attacks that would not be made if those who uttered them were better informed. No statement of a demonstrable fact should be made without an analysis of the conditions, to show that the conclusion reached was correct. He looked upon statistics as being as potent a means of correcting the abuse of corporations as for correcting abuse by them.

In conclusion, the author states that if the accounts of all the industrial plants owned by municipalities were written up completely from the date of their initiation until now, it would be found that the communities who have entered upon these experiments have not gained an economic advantage. Private enterprise, he says, stands ready to-day to take over every one of these plants and perform the service at the same price that such accounts will show it is costing the community where it is rendered, provided the municipality will be willing to grant the same economic advantages assumed by itself, which are an untaxed investment—an untaxed, exclusive, and perpetual franchise.

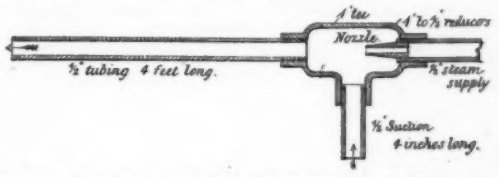
CORRESPONDENCE.

[We are not responsible for opinions expressed by correspondents.]

Preventing Water in Gasholder and Purifier Lutes from Freezing.

Sir,—As many of my colleagues may have experienced difficulties with their gasholder cups and lutes during the recent severe weather, the following hints may be of service. In Denmark and North Germany the frosts have been very severe; the quicksilver often bashfully hiding in the thermometer bulb. But we have experienced no mishaps with any of our twenty gasholders.

We find blowing steam direct into the tanks and lutes to be a very wasteful process; but by employing small injectors (which we have done for years past) made of common gas-barrel fittings, a saving of steam is effected, and freezing effectually prevented.



The great object is to keep the water *in motion*, as well as warm; and this is effected by extending the nozzle or delivery of the injector some 4 feet beyond the suction arm. The water is thus churned over and over; and it is astonishing what a small quantity of steam is required for the purpose.

A tank of say 100 feet diameter requires four injectors, and the lute a similar number, fed from a common steam supply running round the tank. The steam to the lute injectors is carried up the standard, partly by a fixed pipe and partly by a length of the new patent flexible brass tubing. India-rubber tubing wears out quickly, and cannot be depended upon to stand the pressure.

Messrs. Cutler and Co. have an excellent arrangement for carrying the tubing, but I imagine their injector to be similar in principle to our home made one—a sketch of which I give.

F. D. Marshall.

Copenhagen, Jan. 21, 1891.

Mr. Foster's Photometric Apparatus.

Sir,—In the "Register of Patents" in the last number of the Journal, there is a description of a photometric apparatus patented by Mr. W. Foster, of Clement's Inn, W.C. (No. 2671; Feb. 19, 1890). Allow me to state that a similar arrangement (except that for flat-flame burners) has been in use by me for many years—I think about twenty. It was made for me by Messrs. R. E. and C. Marshall of this town.

W. E. Williams.

Cheltenham, Jan. 30, 1891.

Gas-Burners and Discoloured Ceilings.

Sir,—Some years ago, as the result of repeated experiments, I made the statement that the discoloration of ceilings was not caused by any smoke emitted from gas-burners, but from the dust in the air being carried up by the hot current. This statement has received a curious confirmation, which is worth recording.

Six months ago I removed from town into a house well in the country, and standing back a considerable distance from the road. The room most in use in the new house is practically identical in every detail with the old one. The chandelier used in the town house has been removed and fixed in the new one, with the same burners and shades. The same governor is used, giving the same pressure. I find that, although the ceiling in the town house became a decided brown during the winter, the one in the country is at the present time practically as white and clean as at first.

I have no doubt whatever, if lamps were used in the same rooms under the same conditions, that the discoloration in each case would be the same, or if anything that from the lamps would be greater, as it is impossible in practice to prevent lamps smoking occasionally, whereas a good gas-burner never smokes. My original statement was based on the fact that the brown discoloration occurs with an atmospheric burner precisely as it does with a lighting jet, and that smoke (if it exists at all) is black and not brown.

Thos. Fletcher.

Warrington, Jan. 26, 1891.

The Development of Electric Lighting in Bradford.—Extensions of considerable magnitude have been made during the last few months at the electric lighting works of the Bradford Corporation. The provision of accumulators is the latest development; and they were put into operation last Tuesday morning by Mr. Alderman Priestman, the Chairman of the Corporation Gas and Electricity Supply Committee. These accumulators, it is said, will be able to supply 2000 lamps of 16-candle power each for an hour. They are of the Crompton-Howell type, with 65 cells, each 5ft. 6in. long, 12 inches broad, and 12 inches deep. There has also been added to the plant a Willans three-crank compound engine of 300 indicated horse power, and working at the high steam pressure of 140 lbs. to the square inch. This engine drives a dynamo capable of supplying 2500 lamps of 16-candle power each. The dynamo was made by Messrs. Siemens. It is the largest of its class turned out by that firm, and is claimed to be the finest machine they have produced. The total horse power represented now at the station is about 800; there being, in addition to the engine in question, three of about 150 indicated horse power each. Since the beginning of November, three new feeding-mains have been put down in the town, and some additional distributing-mains. When the works were opened, in September, 1889, there were connected with them lamps equal to 8000-candle power; while there are now lamps supplied representing 120,000-candle power.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF COMMONS.

Tuesday, Jan. 27.

THE BOARD OF TRADE AND THE SETTLEMENT OF LABOUR DISPUTES.

Mr. BECKETT gave notice that on Feb. 24 he would submit a motion to the effect that it is desirable that the Board of Trade should appoint a Standing Committee, representative, as far as possible, of the interests of capital and labour, whose duty it shall be to inquire into and report upon all strikes, lock-outs, and disputes of a public character between emloyers and employed; that this Committee should be authorized to arbitrate between the contending parties, if requested by both sides to do so; and that it should have power to appoint Sub-Committees to assist in the performance of its duties.

Wednesday, Jan. 28.

CONSPIRACY LAW AMENDMENT BILL—THE RECENT DECISIONS AFFECTING STRIKES.

Mr. E. ROBERTSON, in moving the second reading of this Bill, explained that its object was to remedy the defects of existing legislation in regard to conspiracy. It was restricted to two small points—viz., to lay down the general principle that, subject to certain specified exceptions, no combination should be treated as criminal unless it was accompanied by a criminal object; and to amend the Conspiracy and Protection of Property Act of 1875 as far as regarded the word "intimidates," in section 7. He was quite aware there was a great deal to be said on the other side; but he was not convinced that there ought to be anything in the mere fact of combination which should impart criminality into proceedings which were in themselves crimeless. The Criminal Law Commissioners said that any agreement to commit an unlawful act was a conspiracy; but as no definition had been found as to what constituted unlawfulness, it seemed to the Commissioners undesirable that there should be any criminal offence in which these elements were left in doubt. Surely it was not fair to leave the law in this state, even in the hands of Judges; and certainly it was not right to impose upon Resident Magistrates the duty of administering a law which, in the opinion of the highest authority, was in so uncertain a state. By clause 4 of the Bill, he proposed to amend section 7 of the Conspiracy and Protection of Property Act, 1875. The offence referred to in that section consisted first, in offering violence either to person or property; and, secondly, in intimidation. It was within the knowledge of the House that section 7 had received a startling interpretation by Mr. H. M. Bompas, Q.C., the Recorder of Plymouth (see *ante*, p. 114), and by the County Court Judge of Newcastle, Mr. Digby Seymour, Q.C. Mr. Bompas held that, where a Union ordered men to leave their work because their masters refused to dismiss non-unionists, it was intimidation within the meaning of the section referred to. He (Mr. Robertson) proposed to limit it to such intimidation as would justify a Justice of the Peace binding over the parties to keep the peace. These words were put into the Criminal Law Amendment Act of 1871, and agreed to by the House; but they were struck out of the Bill in the House of Lords. His proposal was that the House should afford an opportunity of defining conspiracy and intimidation. He held that these were at present vague offences, and that the danger particularly affected the poor and the artizans of the country.

Mr. FENWICK, in seconding the motion, expressed the opinion that the law of conspiracy, as laid down in the Conspiracy and Protection of Property Act of 1875, applicable to this country, had been mixed up with the Criminal Law Amendment Act passed in 1887, and applicable only to Ireland.

Mr. G. BRUCE moved the rejection of the Bill. He said the only reason which had been given for altering the law was that a view had been taken of it which had surprised many who had devoted some attention to the matter. But supposing this decision had been given by a Judge of a Superior Court, would the House proceed to legislate before the appeal? It was a most unusual thing that they should be asked to legislate in this matter when an appeal was pending.

Mr. DARLING seconded the amendment, agreeing, as he did, with the decision of the Recorder of Plymouth.

Sir W. HARCOURT said the Bill before the House merely proposed to enact provisions which were struck out of the Act of 1875 by the House of Lords. He regarded the judgment of Mr. Bompas as a direct consequence of the mutilation of that Act; and he asked the House to read the Bill a second time.

The SOLICITOR-GENERAL remarked that the Bill raised two separate and distinct questions. The first, which deeply interested the Trade Unions of this country, was dealt with in clause 4. Why was it unreasonable to ask the House to accept that clause? The Act of 1875 had been administered for sixteen years, and no fault had been found with it until November last, when Judge Seymour, at Newcastle, gave a decision. This was followed by that of the Recorder of Plymouth. These, he agreed, were serious decisions; but with reference to that of Mr. Bompas, he (the Solicitor-General) would not express any opinion as to the correctness or otherwise of the views therein contained, because he had been informed by the Attorney-General that a case for the opinion of a Superior Court was being prepared. The question as to the interpretation of the Act of 1875 having been raised only within the last month or two, there was no justification for this sudden attempt to ask the House to read a second time a Bill which assumed that the decision given at Plymouth was incorrect. With regard to the other part of the Bill, Trade Unions had no sort of concern whatever. He thought it was the duty of the Government to ask the House not to sanction the second reading of the Bill, on the ground that no attempt had been made to show that there was mischief in the existing law of conspiracy requiring the interposition of Parliament; and that, if there were, it would be necessary to introduce a measure very different from that before the House.

After a few remarks from Sir C. RUSSELL in support of the Bill,

The House rejected the motion by a majority of 36.

Thursday, Jan. 29.

The Chairman of Ways and Means (the Right Hon. L. H. Courtney) reported that, having conferred with the Chairman of Committees of the House of Lords (the Earl of Morley) on the subject, it had been determined by them that the following Bills in which our readers are interested should originate in the Upper House: Alloa Water Bill, Brentford Gas Bill, Bristol Gas Bill, Bude Harbour and Canal (Abandonment) Bill, Dundee Water Bill, Filey Water and Gas Bill, Gaslight and Coke Company Bill, Glasgow Boundaries Bill, Kettering Gas Bill, Llanelly Local Board Water Bill, Lynton Water Bill, Malvern Water Bill, Mountain Ash Local Board Bill, Newark Corporation Bill, Northallerton Water Bill, Partick Gas Bill, Troon Water Bill, Whitehaven Town and Harbour Bill.

Friday, Jan. 30.

THE WATER SUPPLY OF THE METROPOLIS.

The Examiners reported that the Standing Orders had been complied with in the case of the London Water (Meter) Bill and the Metropolitan Water Companies' Charges Bill.

A Bill "to place the water supply of the Metropolis and the adjoining districts under the control of a public authority, and to make further provision for such supply," was brought in by Sir A Borthwick, Mr. Baumann, Mr. Fisher, and Mr. Whitmore, read the first time, and ordered for second reading on March 4.

Mr. LAWSON asked what course the Government proposed to take with respect to the Public and Private Bills affecting the water supply of the Metropolis.

Mr. W. H. SMITH said he thought it would be expedient, when they had been read a second time, to refer them to a strong Hybrid Committee, or to a Joint Committee of both Houses; but he was not able, without further consultation, to give a more definite reply.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.

Wednesday, Jan. 28.

(*Before the* LORD CHIEF JUSTICE *and a Special Jury.*)

Walker v. The Crystal Palace District Gas Company—Pollution of a Stream with Gas Liquor.

The plaintiff in this case resides at Catford, and is the owner of a considerable building estate there. He is also the occupier, on a yearly tenancy, of 21 acres of grazing land, which runs on either side of the River Pool for a distance of about a mile; and his claim against the defendant Company was for a sum of £270, damage alleged to have been caused to him in consequence of the Company allowing a quantity of ammoniacal liquor to flow from their works at Lower Sydenham into that river.

Mr. WINCH, Q.C., and Mr. ATHERLEY JONES, M.P., appeared for the plaintiff; Mr. ASQUITH, Q.C., M.P., and Mr. DANCKWERTS represented the Company.

According to the evidence of the plaintiff, it appeared that on July 18, 1889, he was possessed of fifteen head of cattle, including cows, which were grazing on the land occupied by him, the supply of water for which was obtained from the River Pool. On the afternoon of that day his attention was called to the state of the water in the river, which presented a milky appearance; and he also found that his cattle were very ill. He thereupon followed the course of the river until he came to the Company's works; the water being in the same condition the whole of the way, except for the last 100 yards, where the stream, flowing more quickly, carried away to a great extent the traces of the alleged pollution. He there saw Mr. James Watson, the foreman of the works, and complained of what had happened; and it was admitted by one of the Company's servants, who took some of the water in his hand, that it smelt "gassy." It was afterwards discovered that one of the pipes conveying the ammoniacal liquor to the scrubbers was leaking; thus allowing the liquor to escape into the stream. The effect of this was, according to the plaintiff's case, to kill all the fish in the river (in respect of which he also claimed damages), and to injuriously affect his cattle which had drunk the water. He alleged that he was compelled to remove the cattle to another field, and to keep them out of the meadows in question for several weeks during which the effects of the pollution lasted, the result being that he incurred great additional expense; and finally he was obliged to sell many of them at a very low price. In cross-examination, plaintiff admitted that some months previously the cattle had suffered from ringworm, for which they were attended by a veterinary surgeon.

Mr. *C. Heisch*, F.C.S., was called in support of the plaintiff's case. He deposed to having analyzed two samples of water taken from the river. In one he found ammonia to the extent of nearly 6 grains per gallon, and a considerably larger quantity of lime than is usually met with in the waters of the Pool. There were also slight traces of cyanides in the water, which had a rather foul odour, and when heated smelt strongly of ammonia. With regard to the other sample, which was taken near the Company's works, it contained 52·5 grains of sulphuretted hydrogen and 52 grains of ammonia per gallon, as well as a very large quantity of cyanides. He was of opinion that the water was dangerous to animal and fish life; and the stench arising from it was very bad.

Other evidence having been given in support of plaintiff's case,

Mr. ASQUITH addressed the jury on behalf of the defendants. He contended that the case was one which the Directors of the Company were bound to bring into Court to be decided, in consequence of the way in which the plaintiff had exaggerated his claim. One would have thought from the evidence given, and from the statements made by his learned friend, that the River Pool was a pure stream; but the fact was that on its banks, about a mile above the *locus in quo*, there was a sewage farm; and between that farm and the plaintiff's lands, there were two culverts which conveyed into the river the overflow from the sewers and drains of the Lewisham district. The result was that, so far from being fresh and clear, the stream was a dirty, turbid, and sewage-polluted one. It was no doubt the fact, and it had never been denied, that, owing to an accident to a joint in

an underground pipe at the defendants' works, which no one could have discovered until it made its effects manifest, there did occur a leakage of some weak ammoniacal liquor; but, as soon as it was discovered, everything possible was done to set the matter right. The learned Counsel commented upon the fact that no water had been taken, for the purpose of analysis, from the stream where it flowed through the plaintiff's land; and he contended that it was impossible that the discharge from the Company's works could have had the effect which it was stated to have had by the time it reached the point where the cattle were grazing, which was at least a third of a mile distant. He called the attention of the jury to the fact that there was not the slightest corroboration of the plaintiff's statement as to the condition of the cattle; nor had they had any direct evidence that they were seen to drink the water. They must first find that the cattle did drink it; and if they were satisfied of this, they must arrive at the conclusion that the animals were rendered ill by so doing. The jury must be satisfied upon these two points before they could make the Company responsible for any loss the plaintiff might have sustained. He (Mr. Asquith) contended that the plaintiff had not proved any loss, but, on the contrary, had admitted receiving for some of the cattle a higher price than he paid for them. The learned Counsel then proceeded to comment on certain discrepancies in the plaintiff's evidence, and upon the fact that, when he originally complained to the Company, he had not made any claim with regard to certain of the animals. On behalf of the defendants, the jury would hear Dr. Tidy, who would tell them that the river was largely polluted with sewage, which he (Mr. Asquith) suggested was the real cause of the illness of the cattle. Counsel having dealt in detail with the various items of the plaintiff's claim,

Mr. *Charles Gandon*, M. Inst. C.E., Engineer and Manager of the Company, was called.

Thereupon the foreman of the jury intimated that they had already made up their minds; and he inquired if it was necessary that they should hear any more evidence.

The LORD CHIEF JUSTICE said that, unless they had made up their minds to give a verdict for the defendants, of course they must hear the evidence on their side.

The FOREMAN: As we are advised now, we are in favour of the plaintiff.

After some discussion, resulting upon this announcement, his Lordship suggested that a settlement of the case would be desirable; and it was ultimately agreed between the parties that a verdict should be given for the plaintiff for £100 and costs.

SALISBURY CITY QUARTER SESSIONS.—Saturday, Jan. 24.

(*Before Mr.* W. RAVENHILL, *Deputy-Recorder.*)

The Assessment of the Salisbury Gaslight Company's Works.

This was an appeal by the Salisbury Gaslight and Coke Company against an assessment of their works and mains made last November by the Assessment Committee of the Guardians of the Alderbury Union and the Churchwardens and Overseers of the City Parishes and Milford.

Mr. CRIPPS, Q.C., and Mr. R. J. SETON appeared for the appellants; Mr. E. J. CASTLE, Q.C., and Mr. RATCLIFFE for the respondents.

Mr. CRIPPS, in opening the case, said that the Company had been rated for many years on the sum of about £1280; and this had been raised, by the assessment made last November, to £1963. The case, like the majority of appeal cases now, was almost entirely a question of figures, because the principles upon which the valuation of a gas undertaking for assessment was based had been established for many years. There was always some difference in the application of questions of figures; but practically the question at present in view was one of figures, to which an established principle was to be applied. [Mr. CASTLE: We do not admit that.] He was instructed that the manner in which the assessment first came to be raised was that a gentleman made an offer to the Guardians, to the effect that he was prepared to take the matter in hand on the understanding that his remuneration was to consist of a commission of 6 per cent. on the increase of the valuation. [Mr. CASTLE again dissented.] He would point out that if a gentleman was engaged on this principle, the Union took the risk that would result from the valuer being directly interested in raising the assessment. In the present case, the assessment was raised to the extent of £700, which meant that the valuer received about £42; on the other hand, if the original assessment had been allowed to stand unaltered, he would have received nothing. It was obvious that a man placed in the position of valuer for the Assessment Committee on such terms, must be biassed; and without intending the slightest reflection on the *bona fides* of the gentlemen engaged on the case now before the Court, he maintained that such a system of doing business was not calculated to secure a fair valuation for the Company. He was proceeding to read extracts from the Company's published accounts for the year ending June 30, 1890, with a view of showing the receipts, expenses, and earnings, when

Mr. CASTLE, interrupting, objected to the accounts for 1890 being placed before the Court. He said that the valuation was made prior to the publication of these accounts; and therefore it was impossible for the valuer to know anything about them. The accounts for the previous year had been used for the preparation of the re-assessment; and these were the things to be considered in any questions relating to the accounts of the Company.

After considerable discussion, in the course of which Mr. Cripps pointed out that the 1890 accounts were much less favourable to the Company consequent on the increased price of coal, it was agreed that the 1889 accounts should be taken as the basis for discussion of the valuation.

Mr. CRIPPS, continuing, said that the income of the Company for the year ended June 30, 1890, for gas, rents of stoves and meters, and residual products was £12,270; and that the expenditure for manufacture, distribution, and establishment charges, including repairs and renewals properly chargeable to revenue was £9128—leaving about £3142 as the balance of profit, from which, after allowing the usual deductions, the rateable value was to be arrived at. He should show that, so far from any increase in the valuation being called for, the Company had already been paying upon a valuation that was some £250 or £300 in excess of a just and fair basis.

Mr. *H. E. Jones*, M. Inst. C.E., the Engineer of the Commercial Gas Company, said that he had had 25 years' experience in connection with the management, leasing, and valuation of gas-works. He had examined the accounts and the works belonging to the Salisbury Gas Company, and considered that they were already assessed too highly. It could easily be shown that the new valuation was greatly in excess. According to it, the net value of the property was £1950; and after adding £650 for rates, he arrived at a gross value of £2600, which was some £250 more than the balance of profit shown by the revenue account for the year. He had prepared a valuation of the property, in accordance with the usual practice. He found that a tenant would require a capital of £7626, including about £3000 for meters, stoves, and lamp columns in use, £900 for a stock of coal, £1500 for tools and materials at the works, £1850 cash at bank, and £1328, the balance of the accounts due to the Company, after deducting those owing by them. The usual allowance of 5 per cent. interest, 10 per cent. profit, and 2½ per cent. for risks and casualties, or 17½ per cent. in all, upon this sum would amount to £1332. Then there was an allowance for depreciation, which came to £533. He arrived at this sum by taking the average life of the various portions of the plant that were not covered by repairs and renewals, and supposing that a sum was invested every year at 4 per cent. interest, sufficient to provide a fund for replacing them when necessary. Then there was the insurance of the parts of the plant that could be insured, at 10s. per cent., £35. These items made up a total of £1900; and this deducted from the balance of receipts over expenditure, £3142, gave a remainder of £1242, which he considered to be the gross rateable value. Deducting rates at 5s. in the pound, £248, he arrived at a net rateable value of £994, which he considered a fair and just amount according to the present state of the law on the subject.

Cross-examined: Witness admitted that the £2378, balance of the revenue account for the year ended June 30, 1889, did not include £256 interest on debentures, or £100 carried to the reserve fund. He did not consider that the cost of manufacture was excessive, looking at the circumstances of the Company. They were not like a London Gas Company, who would sell more gas in one street than would be used throughout the district of Salisbury. The length of mains, as compared with the quantity of gas sold, was great; and this would mean a comparatively large loss by leakage. The affairs of the Company were managed skilfully and well, and certainly not against the interests of the consumers. Gas was sold cheaply; and the shareholders received a very moderate profit—only averaging out to about 6 per cent. on the capital. In fact, from a money-earning point of view, the Company was a poor one. He considered that the coal should be taken at its actual cost, for the purpose of valuing, and without any deduction whatever for residual products. The amount charged for repairs and renewals was so small that it certainly could scarcely include any charges rightly due to capital. He did not say that the works had not been maintained in proper repair. But they had only just been kept going; and a little more might have been spent upon them with advantage. The stock of meters, &c., in use was taken at cost price, in accordance with the usual plan. They were renewed when necessary out of revenue, and a tenant would be expected to take them over at cost; so it would not be fair to put them at their actual value considered as second-hand goods apart from the concern. Assuming them to be taken out and disposed of in that manner, their place would have to be supplied by new meters. He did not agree that the cash at the bank—£1855—was an unnecessary item. The Company had not had it in former years; but the concern could not be carried on without floating capital. When they had not cash in hand, they were paying interest to their bankers.

Mr. *Edmund H. Stevenson*, M. Inst. C.E., said that he had had a large experience in connection with the construction, management, and valuation of gas-works. He had made an independent valuation of the works of the Salisbury Gas Company, and considered that a tenant would require a capital of £7798. Making the usual allowances for this, and the statutable deductions, in which he included a quarter's rent, £250, he arrived at a valuation that agreed fairly well with that put in by the last witness.

Mr. *T. Hardick* deposed that he had been Manager of the Salisbury Gas Company for nearly 30 years; and during that time it had fallen to his lot to practically re-construct the whole of the plant. When a gas-pipe was replaced by a larger one, the additional value of the latter was carried to capital; but sometimes he had replaced a small 2-inch pipe by a 3-inch or 4-inch one entirely out of revenue, because he considered that the pipe was too small in the first place. In cases where there was no prospect of additional consumption following the laying of the larger pipe, he considered that the whole expense was chargeable to revenue. The accounts had been accurately kept; and they were prepared by a chartered accountant. The items shown under the head of repairs and renewals did not embrace anything chargeable to capital; but they included everything properly chargeable to revenue.

This concluded the case for the appellants.

Mr. *Castle*, examined by Mr. RATCLIFFE, said he had been engaged in valuing for some neighbouring Assessment Committees; and it was suggested that he should take the present case in hand. It was a very small affair; and he repudiated the idea of being influenced in his decision by the few pounds due to him for commission. In preparing his valuation, he took the amounts received for gas and the rents of stoves and meters, and deducted from them the cost of manufacture, less receipts for residuals, the cost of distribution, salaries and general charges, but not Directors' and Auditors' fees or rents, as he did not consider these charges would be apportionable to a hypothetical tenant. He considered that the item of £275 for bad debts and allowances was too high; and he found that it included an allowance of £20 to an old servant. So he had taken it at £130. The amount he estimated as required for tenant's capital was approximately £6000. As regards depreciation, a portion of the capital consisted of sunk money that could not be replaced, having been spent in fees, expenses, &c., or

in land. He deducted 25 per cent. from the capital on this account. He estimated that the average life of the remainder of the plant would be 60 years; so that £100 per annum would provide for depreciation. Then he allowed £50 for insurance; and 10 per cent. on tenant's capital. These allowances, deducted from the balance of receipts over expenditure, £3455, gave a gross rateable value of £2705. After allowing for rates at 5s. in the pound, this brought the net value to about £2050.

Cross-examined: Witness said he had consulted previous balance-sheets in order to arrive at the item of £130 for bad debts. They would be liable to vary from year to year; and one year must be taken with another. He had had considerable experience in valuations for rating purposes, but could not quote any authority for his assumption that 10 per cent. was a sufficient allowance for tenant's capital.

Mr. *T. Dinwiddie*, F.I.S., said he had had a large experience of valuing in connection with rating assessments, and had been engaged by all the London Gas Companies at one time or another. He had valued the property of the Salisbury Gas Company. His estimate of the amount of capital required by the hypothetical tenant came very close to that stated by the previous witness; but he deducted repairs and renewals from it as being a landlord's charge. This brought his estimate to £5263; but he was prepared to allow 15 per cent. on it, which amounted to a deduction of £783. He also allowed five-twelfths of the gross expenditure as part of the tenant's capital. He considered £100 as sufficient to cover both sinking fund and insurance, and agreed with the previous witness in putting the average life of the gas-works plant at 60 years. The gross rateable value that he arrived at was £2594, which, after deducting rates at 5s. in the pound, gave £2075 as the net value.

Mr. CASTLE then addressed the Court in support of the estimate made by the Guardians. He contended that, while 17½ per cent. on tenant's capital might have been a proper allowance in former years, 10 per cent. was quite enough in the present state of the money market. He also claimed that the Directors and Auditors had nothing to do with the hypothetical tenant. They merely declared the dividend, and looked after the affairs of the shareholders; while the working profits were earned by the Manager and other employees. He urged that the estimate for tenant's capital was excessive. Assuming that he commenced operations at the busiest part of the year, it would apply for the first quarter; but not in subsequent quarters, or at any other period of the year. In this matter he claimed that a fair average should be taken, and not one extreme. With regard to the £1855 cash as the balance which had been included on the other side as a part of the tenant's capital, it was really cash received for some shares just sold, and not a part of the working capital at all. No such sum appeared in the accounts in other years.

Mr. CRIPPS then replied upon the whole case. The chief efforts of his learned friend, he said, had been directed to the breaking down of the long-established rule of 17½ per cent. on tenant's capital, and substituting 10 per cent. No authority on gas-works was given for this; but his own witness, Mr. Dinwiddie, was willing to allow 15 per cent. So the point at issue was narrowed down to a difference of 15 as against 17½ per cent. The Directors and Auditors were really to some extent managers of the undertaking, and exercised a general supervision, not only as to matters relating to dividends, but over the whole of its affairs. He contended that the valuation put forward by Mr. Jones and Mr. Stevenson had not been shaken; and therefore that it formed a fair basis for the assessment of the Company.

The DEPUTY-RECORDER reserved his judgment.

Sulphur in the Chartered Company's Gas.—At the Worship Street Police Court last Thursday, Mr. Bushby gave judgment in the proceedings instituted by the London County Council against The Gaslight and Coke Company (see *ante*, p. 81) for an excess of sulphur in the gas supplied at the testing-place at Kingsland on the 29th of September last. The Company set up a defence that the Act of 1880, regulating the testing of the gas for sulphur impurity, required that the testings should be taken on three "consecutive" days, and specified that the mean average purity was to be accepted as the standard. In this instance, there had been no testing for three "consecutive" days; the 29th of September being a Monday, and no tests being made on Sundays. Mr. C. A. Roberts, for the Council, contended that the word "day" in the Act meant only "week-days," and the mean average submitted was, therefore, of the Saturday, Monday, and Tuesday. Mr. Bushby overruled the point. He thought the justice of the case would be met by a fine of 1s. (the full penalty being £50) and 23s. cost. Mr. Horace Avory represented the Company. A case was applied for on the question of the three consecutive days; and Mr. Bushby said he would willingly state one.

A Water-Rate Dispute at Sheffield.—Last Saturday week, Dr. Samson Mathews was summoned at the Sheffield Town Hall for non-payment of the water-rate for two houses in Duke Street. The case had previously been before the Court, when the Doctor stated that he sold the property in August last, and gave notice at the water-works office on Nov. 14; and, therefore, ought to be free from the rate in question, which was for the December quarter. Mr. Sayer, the Deputy Town Clerk, who appeared in support of the summons, explained that, under the Water-Works Clauses Act, the occupier of any dwelling-house or part of a dwelling-house liable to the payment of a water-rate who should give notice of his intention to discontinue the use of the water, or should remove from his dwelling between quarter days, must pay the rate for the full quarter. This applied, by a subsequent provision, to owners. The Corporation, however, did not insist upon the payment of the full rate, but apportioned what ought to be paid; and there was no reason why this should not have been done in the Doctor's case if notice was given. But it was denied that he gave notice on Nov. 14 that he had sold the two cottages. Mr. Terry, the Assistant Manager, had invited the Doctor to call and see him as to this matter of notice; but the request was not complied with. The defendant strongly averred that he gave the notice, and mentioned that there had been a long-standing dispute between him and the Water Department as to a meter for the property. The Bench said that defendant must pay the rate, with costs.

MISCELLANEOUS NEWS.

THE GASLIGHT AND COKE COMPANY.

In the JOURNAL last week we published the report of the Directors of the above Company for the half year ending Dec. 31 last, together with those of the chief officials. As the document did not reach us till just as we were going to press, our usual extracts from the accounts, and our comments upon them, had necessarily to be deferred. The latter will be found in another portion of our issue to-day; and we give the former below.

Nos. 1 and 2 are the statements of stock, share, and loan capital on Dec. 31 last, the totals of which are as follows: Stock and share capital, £8,279,000; loan capital, £2,444,000. These figures show an advance on those for June 30, 1890, which were £8,103,000 and £2,186,000 respectively.

No. 3 is the capital account, the receipts on which at the close of last year amounted to £11,362,500; comprising the above-named amount of share and loan capital, and £639,500 of premium capital. This is an advance of £671,600 as compared with June 30 last; consisting of £176,000 of preference stock, with £81,250 of premiums thereon, and £258,000 o fdebenture stock, with £156,350 of premiums. The expenditure is shown in the following items:—

Expenditure to June 30, 1890			£10,441,760 19 10
Expenditure during the half year to Dec. 31, 1890, viz.:—			
Lands acquired, including law charges	£642 6 4		
Buildings and machinery in extension of works	158,348 2 6		
New and additional mains and service-pipes	6,847 15 6		
Do. do. meters	9,263 18 5		
Do. do. stoves	28,775 15 11		
	£203,877 18 8		
Cr.			
Sale of surplus land	£3,022 11 7		
Depreciation of meters	4,036 0 0		
Do. stoves	5,518 0 0		
	12,576 11 7		
		191,301 7 1	
		£10,633,062 6 11	
Balance of capital account		729,437 13 1	
		£11,362,500 0 0	

Nos. 4 and 5 are the revenue and net revenue accounts. These are given in full on the opposite page.

No. 6 is a statement showing how the Directors propose to appropriate the balance applicable for dividend. It is as follows:—

Dec., 1889.				
£285,956	...	Net balance brought from last account	£7,392 16 0	
288,829	...	Net revenue for the half year	202,502 10 10	
..	...	Amount to be withdrawn from the reserve fund	145,695 12 2	
				£355,590 19 0
£574,785				
(13¾ per cent.)		A dividend on the ordinary stock—		
£376,105	...	13 per cent. on £5,470,630	—	355,590 19 0
£198,680	...	Balance carried to next account		..

Nos. 7 and 8 are the reserve and insurance fund accounts. The former shows that the balance of the reserve fund on June 30 last was £524,296 8s. 6d., which was increased at the close of the past year to £531,395 5s. 4d., by the addition of £7098 16s. 10d.—interest on the amount invested. The insurance fund stood at £84,813 16s. 5d. at the end of June; at the close of the year it amounted to £85,962 3s. 7d.

No. 9 is the depreciation fund account. It stood at £37,381 13s. 5d. on June 30 last; and by the end of the year it had been raised to £38,637 16s. 2d. by the addition of £750 brought from the revenue account, and £506 2s. 9d. received as interest.

Nos. 10 and 11 are as follows; and Nos. 12 and 13 are given on the opposite page.

No. 10.—STATEMENT OF COALS USED, ETC.

Description of Coal.	In Store, June 30, 1890.	Received during Half Year.	Carbonized during Half Year.	Used during Half Year.	In Store, Dec. 31, 1890.
	Tons.	Tons.	Tons.	Tons.	Tons.
Common	237,843	1,049,499	940,377	1,227	345,738
Cannel	25,159	35,269	54,101	—	6,327
Total	263,002	1,084,768	994,478	1,227	352,065

No. 11.—STATEMENT OF RESIDUAL PRODUCTS.

Description.	In Store, June 30, 1889.	Made during Half Year.	Used during Half Year.	Sold during Half Year.	In Store, Dec. 31, 1890.
Coke—tons	2,025	604,505	133,093	439,800	34,537
Breeze—tons	2,603	63,992	22,499	35,242	8,854
Tar—gallons	452,853	10,800,006	10,355,223	13,426	884,210
Ammoniacal liquor—butts	17,018	290,522	266,683	11,647	29,210

Gas and Electric Lighting in Paris.—The Paris Municipality have lately been occupied in discussing the Budget for the current year, in which gas and electricity figured prominently. It is estimated that the City will benefit to the extent of about 19,500,000 frs. by the payments they will receive from the Paris Gas Company under the terms of the Treaty. Two recent installations of the electric light—one in the Avenue de Clichy, and the other in the Auber—gave rise to some remarks. The former, which is on the arc system, is satisfactory to the inhabitants, but it is far more costly than gas; the latter, on the incandescent system, costs twice as much as gas with equal luminous intensity. This lighting is to be discontinued from the 31st prox. A few evenings since, the principal Boulevards were suddenly deprived of light by the extinction of the electric lamps; thereby plunging the shops and cafés into obscurity. Fortunately, gas was available; and the disused jets were again brought into operation. After an hour's interruption, the electric lights were once more in operation.

ACCOUNTS OF THE GASLIGHT AND COKE COMPANY FOR THE HALF YEAR ENDING DEC. 31, 1890.

No. 4.—REVENUE ACCOUNT.

Dr. Cr.

Dec. Half Year, 1889.	To Manufacture of gas—	£ s. d.	£ s. d.	Dec. Half Year, 1889.	By Sale of gas—	£ s. d.	£ s. d.
£553,887	Coals, including dues, carriage, unloading and trimming (see Account No. 10)	788,989 19 1		£1,033,043	Common gas, per meter, at 2s. 9d. and 2s. 3d. per 1000 cubic feet.	1,193,150 4 8	
9,953	Salaries of Engineers and other Officers at works	10,108 15 2		39,097	Cannel gas, per meter, at 3s. 5d. per 1000 cubic feet	44,682 0 1	
162,010	Wages (carbonizing)	180,825 0 0		66,887	Public lighting and under contracts— Common gas	69,289 11 10	
31,099	Purification, including £20,569 11s. 11d. for labour	41,901 18 5		2,666	Cannel gas	2,689 11 0	
	Repair and maintenance of works and plant, materials and labour, less received for old materials,			£1,141,693	(See Statement No. 12.)		1,309,802 7 2
144,915	£2095 10s. 5d.	178,727 1 4		26,347	Rental of meters	..	27,584 14 0
			1,200,452 14 0	3,334	Rental of stoves	..	6,229 9 8
	Distribution of gas—				Residual products—		
	Salaries and wages of Officers			238,429	Coke, less £36,339 9s. 2d. for labour, &c.	277,053 13 10	
23,424	(including Rental Clerks)	23,012 19 3		5,967	Breeze, less £2505 18s. 7d. for ditto	7,489 17 6	
	Repair and maintenance of mains			88,145	Tar and tar products	116,460 11 8	
27,467	and service-pipes	27,993 14 8			Ammoniacal liquor and sulphate		
14,765	Repair and renewals of meters	16,773 1 6		84,267	of ammonia	65,222 13 7	
15,782	Stove fixing, repairs, and renewals	22,881 13 7					466,226 16 2
				3,626	Rents receivable		3,659 13 11
	Public lamps—		90,661 9 0	214	Transfer fees		192 2 6
15,461	Lighting and repairing	16,092 16 4		300	Canteen account		300 0 0
129	Experimental street lighting	189 1 10		564	Law charges		..
			16,281 18 2				
	Rents, rates, and taxes—						
3,429	Rents payable	3,388 7 9					
77,266	Rates and taxes	77,092 6 6					
			80,480 14 3				
	Management—						
2,750	Directors' allowance	2,750 0 0					
200	Company's Auditors	200 0 0					
	Salaries of Secretary, Accountant,						
7,493	and Clerks	7,972 0 4					
14,469	Collectors' commission	14,676 7 11					
4,183	Stationery and printing	4,605 2 10					
1,399	General charges	1,619 6 2					
			31,822 17 3				
3,894	Parliamentary charges	..	535 11 8				
..	Law charges (including Surveyor's charges *re* Quinquennial Valuation)	..	3,538 4 5				
6,100	Bad debts	..	6,348 12 4				
	Depreciation fund, for works on lease-						
750	hold land	..	750 0 0				
9,009	Annuities	..	9,623 13 3				
	Public Officers—						
846	Gas Referees and Official Auditor	849 8 4					
1,347	Public testing-stations	1,099 18 9	1,949 7 1				
£1,132,027			1,442,445 1 5				
450,919	Balance carried to net revenue account, No. 5		371,550 2 0				
£1,582,946			1,813,995 3 5	£1,582,946			1,813,995 3 5

No. 5.—NET REVENUE ACCOUNT.

Dr. Cr.

Dec. Half Year, 1889.		£ s. d.	£ s. d.	Dec. Half Year, 1889.		£ s. d.	£ s. d.
£54,920	To Interest on debenture stocks and bonds, accrued to Dec. 31, 1890	..	59,642 13 9	£662,021	By Balance from last account	362,988 2 0	
					Less dividend on the ordinary capital		
59,759	Dividend on the preference stocks	63,279 5 0		376,065	for the half year to June 30, 1890	355,590 6 0	
47,500	Dividend on the maximum stocks	47,500 0 0		£285,956			7,392 16 0
			110,779 5 0		The South Metropolitan Gas Company, amount of damages awarded by the Special Referee appointed by		
..	Interest on temporary loans and sundry funds		4,819 4 5				
574,785	Balance applicable to dividend on the ordinary stock		209,895 6 10	..	High Court of Justice (Chan. Div.)	..	6,193 12 0
				80	Net amount of interest on money on deposit	..	..
				450,919	Revenue account (No. 4)	..	371,550 2 0
£736,964			385,136 10 0	£736,964			385,136 10 0

No. 12.—STATEMENT OF GAS MADE, SOLD, Etc.

Description of Gas.	Quantity Made.	Quantity Sold. Public Lights and under Contracts (estimated).	Quantity Sold. Private Lights (per Meter).	Quantity Sold. Total Quantity Sold.	Quantity used on Works, &c.	Total Quantity accounted for.	Quantity not accounted for.	Number of Public Lamps.
	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	
Common	9,807,572	493,677	8,735,927	9,229,604	123,748	9,353,352	454,220	48,734
Cannel	294,520	16,696	261,553	278,249	1,919	280,168	14,352	2,212
Total	10,102,092	510,373	8,997,480	9,507,853	125,667	9,633,520	468,572	50,946
Dec. half year, 1889	9,638,517	493,647	8,547,847	9,041,494	112,053	9,153,547	484,970	49,671

No. 13.—GENERAL BALANCE-SHEET.

Dr. Cr.

Dec. Half Year 1889.		£ s. d.	£ s. d.	Dec. Half Year 1889.		£ s. d.	£ s. d.
£	To Capital—			£			
302,127	Balance at credit thereof	..	729,437 13 1	96,578	By Cash at Bankers	..	114,346 4 7
	Net Revenue—						
574,785	Balance at credit thereof	..	209,895 6 10		Amount invested—		
	Reserve Fund—				2½ per Ct. Consolidated Stock . . £654,099 11 4	..	638,498 18 2
517,198	Balance at credit thereof	531,395 5 4		696,999			
	Insurance Fund—				Stores on hand, viz.—		
83,665	Balance at credit thereof	85,963 3 7		64,669	Coals	274,651 9 5	
	Depreciation Fund—			12,781	Coke	21,525 18 0	
36,136	Balance at credit thereof	38,637 16 2			Tar and ammoniacal liquor and		
			655,995 5 1	114,854	products	101,939 2 9	
	Interest on debenture stocks and bonds,			137,788	Sundry stores	173,007 16 9	
54,920	due on Dec. 31, 1890	..	59,642 13 9				571,124 6 11
	Preference and maximum dividends						
107,239	due on Dec. 31, 1890	..	110,779 5 0		Accounts due to the Company, viz.—		
	Unclaimed dividends due on Dec. 31,				Gas and meter rental—		
10,896	1890	..	10,670 18 6	791,020	Quarter ending Dec. 31, 1890	917,395 13 8	
	Sundry tradesmen and others, for			14,351	Arrears outstanding	13,654 5 4	
	amount due for coals, stores, and						931,049 19 0
228,148	sundries	..	844,357 1 0	46,310	Coke and other residual products	63,192 18 7	
1,667	Benevolent Fund	..	1,667 6 8	1,561	Sundry accounts	4,233 2 8	
..	Temporary Loan	..	200,000 0 0				67,426 1 3
1,916,711			2,322,445 9 11	1,916,711			2,322,445 9 11

THE GLASGOW GASHOLDER DISASTER.

The Experts' Report—Offer of a Reward by the Gas Committee.

In another part of the JOURNAL to-day, we deal at some length with the results of the investigation, so far as it has gone, into the cause of the disaster at the Dawsholm Gas-Works of the Glasgow Corporation. These were made known on Monday of last week—too late for notice in our last issue—by the publication of the report of the four experts called in to examine the destroyed holders, and inquire generally into the affair. This report, which was submitted to the Gas Committee at a special meeting held on the above-named day, was as follows:—

To the Gas Committee of the Glasgow Corporation.

Gentlemen,—In accordance with your request, the undersigned have made a careful and exhaustive investigation into the circumstances connected with the accident to the two gasholders at your Dawsholm Gas-Works, and have now the pleasure to submit to you the results, so far as we have been able to ascertain them.

We are satisfied that there was no explosive mixture in the gasholders, and that the accident was not due to any defect in the gasholders or in their working. We found indications of some explosive material having been placed on the crown of No. 2 gasholder. The explosive power penetrated inwards; and this was, in our opinion, sufficient to cause the destruction of the holder and ignite the gas. The concussion thus produced was, in our opinion, sufficient to rupture the sheets of No. 1 gasholder, and cause its destruction.

The whole of the gas from these two gasholders, amounting in the aggregate to about 3 million cubic feet, simply burnt out without doing any further injury to the gas-works or any injury whatever to the surrounding neighbourhood.—We are, yours respectfully,

(Signed) WILLIAM ARROL.
GEORGE LIVESEY.
CHAS. HUNT.
ANDREW GILLESPIE.

Jan. 23, 1891.

After carefully considering the report, the Committee decided to offer a reward of £1000 for information which would lead to the detection of the perpetrators of the outrage. On the same occasion, Mr. Foulis stated that, so far as he had been able to ascertain, the cost of repairing each of the two damaged holders would be about £2500, or £5000 altogether. Colonel Ford and Dr. Dupré, who have been investigating the matter for the Government, will submit their report to the Home Office. It will not in the meantime be made public; but it is understood that it will corroborate the one given above.

It is scarcely necessary to say that the experts' report has been criticized by correspondents in the local papers. One writer says that on reading it "one is struck with the absence of any analysis or report from a chemical expert on explosives, verifying any proof of an explosive compound being found on the top of No. 2 gasholder. On the contrary, it is just as likely the hole downwards was caused by a projectile from the *débris* of No. 1 gasholder which flew about after No. 2 was down. It is said the accident took place in three minutes after the valve-man turned the gas from it into No. 3 gasholder. If it was maliciously exploded, it is a miraculous coincidence that both should happen together before the man had time to walk from one valve to shut the other. It is also remarkable that, if it was an explosive that worked the mischief, no one heard it. Are not all explosives apt to go off like a cannon, and smash the glass for many hundred yards round, as at Tradeston, and simultaneously produce a flash which would ignite the gas at once? Those at a distance—even as far as Kilbowie—distinctly saw, against the clear evening sky, the gas rise like a small dark cloud, and then the flame was run up like a long stream of fire from the wreck; showing that the gas escaped some time before the igniting medium took effect, which may have been from lamps about the gasholders or sparks from passing locomotives. The question for explosive experts is, Would one go off without making a noise or flame sufficient to ignite gas? If not, the doubtful theory cannot be further considered." Another correspondent suggests that a chemical expert should investigate the matter. He says: "My theory is that the accident was due to unusual chemical conditions rather than incendiarism. I would particularly ask if the usual gas coal was employed in manufacturing the gas which exploded, or if, from want of coal, any untested coal from other sources (which the railway strike may have necessitated) was used, and abnormal conditions were introduced. I would without prejudice suggest that an unusual quantity of carbonic acid had been generated in these gasholders; and, further, that the intense cold had liquefied this gas. Now, 100 measures of liquid carbonic gas at 20° expand to 150 measures at 30°—more, indeed, some chemists say; and this increase in volume might readily enough explode the gasholder, even though its workmanship was beyond reproach."

A Fire in a Purifier at a Leeds Gas-Works.—Last Tuesday an alarm of fire was raised at the Meadow Lane Gas-Works of the Leeds Corporation. The Fire Brigade were summoned; and on going to the works, they ascertained that there was a fire in one of the purifiers. The Manager of the works (Mr. George Tooley) had the gas turned off; and it was found possible to extinguish the flames by means of a small hose-pipe kept on the premises and buckets of water. As to the origin of the outbreak, it is supposed that a plug gave way; thus allowing gas from the retorts to become ignited. Little damage was done.

The Proposed Adoption of Oil for Public Lighting at Cowes.—If the ratepayers of West Cowes who met together last Wednesday week to consider the question of public lighting may be taken as representing the views of the inhabitants generally, the latter are not very particular as to how their streets are illuminated. A Committee of the Local Board appointed to consider "the best and cheapest method" of lighting the town, recently reported that the saving by the use of oil would be so great that they had no alternative but to recommend it for lighting the streets. This recommendation was endorsed at the meeting of ratepayers; and a resolution was passed asking the Board to light the streets with oil, unless the Gas Company were prepared to lower their price, so that the expense for gas should not be greater than that for oil. The cost of lighting Cowes by oil may be cheaper than doing it by gas; but that it is the "best" and most efficient method of lighting has been proved by Erith not to be the case.

DESTRUCTION OF A GAS-WORKS AT CONSTANTINOPLE.

The truth of the saying that "misfortunes never come singly" is exemplified by two events recorded in the present issue of the JOURNAL. Fortunately, it is not often that an accident such as that which recently occurred in Glasgow, the cause of which we are now in a position to explain, has to be chronicled; but no sooner is this done than news reaches us of a catastrophe at a gas-works in Constantinople, whereby a large holder and most of the plant have been wrecked. In this case, however, it was not dynamite, but the elements, that did the mischief, which it is to be regretted was attended by the sacrifice of three lives. We are indebted to a correspondent on the spot for the following interesting particulars of the occurrence:—

On the night of Friday, the 23rd ult., a terrific storm of wind and rain swept over Constantinople and its vicinity, and caused a dreadful accident, unhappily attended by the loss of three lives, at the works of the Yedi Kouli Gas Company. These works are comparatively new, having been completed about nine months ago, and are situated on the Stamboul side of the Bosphorus, supplying gas to that side of the city only. Upon the works was a large single-lift gasholder about 40 metres (131 feet) in diameter and 10 metres (33 feet) deep, working in a steel tank erected above ground. A balcony ran round the top of the tank, and was carried on brackets rivetted to the side; the brackets also supporting the wrought-iron lattice columns that guided the holder. It appears that about five o'clock on Saturday morning (the 24th), some of the brackets on the windward side of the tank gave way, and in falling tore the tank from top to bottom. The holder was about two-thirds full at the time; and one of the falling girders made a long rent in it. The escaping gas caught fire at a light burning in the meter or photometer room; and there ensued a dreadful explosion, which nearly wrecked the works. The holder was lifted about 20 feet away from the tank, and deposited nearly intact, with the exception of a slight buckle in the side sheeting. The girders and columns seem to have fallen in pairs; and each pair as it fell tore the tank down to the very foundation plates. Singular to state, all the columns fell outwards. The water from the tank swept away part of the house of the engine-driver; and the explosion completed the havoc thus begun—burying the poor fellow, with his wife and child, in the ruins. The purifier-house was razed to the foundation; only a small portion of one of the boxes being left. At the time of the accident the house contained four purifiers, about 16 feet square; and three of these have entirely disappeared, as scarcely a portion of them can be seen. The connections leading to the station meter were torn away; but otherwise the meter appears to have escaped serious damage. The station governor was badly damaged; and the whole side of the engine and exhauster house was blown inwards by the force of the explosion. The retort-house, condensers, scrubbers, and exhausters escaped any serious damage; otherwise the place was a complete wreck. The Company possess on the same site the old works formerly used; and these will be utilized as far as possible to supply the city, until measures have been taken to remedy the disaster. In the meantime, the street lamps are being lighted by petroleum. The gas-works at Dolma Baghtche sustained scarcely any damage; but, unfortunately, no assistance could be given to the Yedi Kouli Company, as no mains can be laid across the two pontoon bridges that span the Bosphorus, owing to their being opened daily to allow of the passage of vessels into the harbour. The Engineer of the Imperial Ottoman Gas-Works at Dolma Baghtche (Mr. W. S. M'Gregor), accompanied by his Assistant (Mr. A. M. Learmonth), rendered what aid could be given under the circumstances; and much sympathy is expressed for the Engineer of the ill-fated works—Mr. Schönheyder.

PARA GAS COMPANY, LIMITED.

The Ordinary General Meeting of this Company was held last Thursday, at the London Offices, 16, St. Helen's Place, E.C.—Mr. ULICK J. BURKE in the chair.

The SECRETARY (Mr. T. S. Borradaile) read the notice convening the meeting; and it was agreed to take as read the Directors' report for the six months ending Sept. 30 last, the principal features of which were given in the JOURNAL last week (p. 164).

The CHAIRMAN, in moving the adoption of the report and accounts, first called attention to the state of the Company's finances. He said the shareholders would observe that the revenue account showed a net profit of £3252, which, with the amount at the credit of profit and loss, after writing off the amounts sanctioned at the last general meeting, made a balance of £5442. It would be remembered that at the last meeting they sanctioned the Directors to put by £5000 out of the profit to establish a reserve fund, and also to allocate £1500 for a special reserve fund for coal. As was explained at the time, it was absolutely necesary that the Company should have a stock of coal at Pará. The Board recommended that they should pay the dividend on the preference shares; but in the report they did not propose to declare a dividend on the ordinary shares, because they had not funds in hand, owing to the unpunctuality of the payments by the Government. Some time ago they did pledge themselves to pay a dividend when they received sufficient funds; but in future they thought that it would be better not to declare a dividend unless they had money for the purpose in hand. Since the report was issued, however, they had had promised another remittance from the Government; and he believed it would be of such an amount as would enable them to declare a dividend on the ordinary shares. The Board would probably call a meeting of shareholders a week or so before March, to formally declare a dividend of 2 per cent. for the year. While congratulating the shareholders upon this remittance from the Government (which, by the way, would have affected the report very much had it come in time), he was bound to say that it had its drawback in the matter of exchange. The loss on exchange was a serious question with the Company. It would be noticed in the accounts that the loss in the second half of the year amounted to no less then £1056; and he

was sorry to say that on this new remittance they would suffer very severely in exchange. The Company were entitled, by clause 16 of the contract, to be paid by the Government, in monthly instalments, at the rate of 27d. per milrea. What happened was this: The accounts were calculated at the rate of 27d. per milrea; but the payments were not made at the time. Therefore, supposing that when the account was rendered, and was calculated at 27d., the rate of exchange was 22d. or 24d., by the time the account was paid, the rate of exchange—and they had constantly found this—had fallen considerably, and they had to remit home at a considerable loss. It might perhaps be said, Why remit at that time? Why not wait and take the chance of the market rising? To a certain extent it was the practice of the Board for some time to wait and see whether there would be a better market; but they came to the conclusion that they should not do this. Their business was to make gas, and sell it; and they were not called upon to add speculation to their existing cares. Besides exchange, they continued to suffer from the imposition of fines, which was a difficult thing to check. They went to some trouble and expense in going round with the rondas to inspect the lamps; but the fines were still levied, and in a very unjust manner. The working of the half year had not proceeded without considerable anxiety. Those who knew Pará would agree that gas-works there could not be conducted without anxiety; but during the past year it had been aggravated by reason of the sickness of the staff. The sickness began in September, and continued into October. Their Chief Engineer (Mr. J. Gibson Newbigging) was taken ill; and he tried a short voyage to reinstate his health. But it was unsuccessful; and he had to be invalided home. Mr. Cocks, who was second in command, took charge of the works; and the Chairman spoke very highly of the manner in which, after only a few weeks' experience in Pará, he had undertaken the management of the Company's affairs. Mr. Rigby and Mr. Farmer had also to leave the works; and Mr. Cocks was then the only European on the works. The Board did not think it prudent to continue in this position; and they therefore invited Mr. Gilmore—who had been in the employ of the Company as Accoun tant, and, having fulfilled his term, had come home—to go out there, and he readily consented. They were also fortunate in having secured Mr. W. Newbigging (who had recently returned home from Japan) to go to Pará, and take his brother's place. Their Engineer-in-Chief was present; and he (the Chairman) was glad to say was looking a good deal better than when he arrived home. With reference to the new concession, he believed the shareholders were told at the last meeting that the Board had hopes of getting it, but that the general elections were coming on, and would no doubt retard the matter a little. He was sorry that they did not appear to be getting much more forward. They were constantly petitioning the Government; but there always seemed to be something to delay the matter. They now learnt that tenders were to be advertised for, inviting competitors to supply gas in Pará. Whether or not they would do so, he did not know; but from the experience gained since he had been on the Board, he could say that anybody who took over the supply of gas at Pará, and tried to undersell them, would have a difficult task. He understood that tenders would be received up to July 19; and until then the Board would not have any definite information for the shareholders.

Mr. LAMBERT inquired how long the present concession had to run.

The CHAIRMAN said that the concession was granted for 30 years in October, 1862; and it expired in October, 1892.

Mr. A. H. HENRY seconded the motion, and called attention to the fact that the loss on exchange was something like 25 per cent. of the profits for the half year. They would not have lost nearly so much had they been paid punctually by the Government. Besides this, the latter made them do more than they undertook to do in their contract—for instance, they supplied gas 50 per cent. above the necessary illuminating power.

Mr. CUFF asked for some further explanation as to the additional loss on exchange which the Company experienced by the Government not paying at the time the accounts were rendered.

The CHAIRMAN replied that, when the accounts were made up, the then rate of exchange was taken—say, it was 24d., the difference was made up in the account to 27d. The account, however, might not be paid for several months; and they constantly found that in the meantime the rate of exchange fell. Supposing it dropped from 24d. to 19d. (as it happened to be now), there was a loss of 5d., which was a serious thing for the Company. If the rate appreciated, they might obtain some little advantage; but he could not really say that they had ever experienced this.

Mr. NEWBIGGING, replying to a further question, said the accounts were delivered as they became due, on the last day of the month; and the exchange on that day was taken.

Mr. LAMBERT remarked that he was pleased to hear the Directors proposed to pay a dividend; but he thought it would have been better if they had done as on a previous occasion—declared a dividend at the general meeting, and paid it when they had the money in hand. On the question of the new concession, he personally thought that the longer it was delayed, the worse contract they were likely to make; and he asked how the Company would stand at the end of the present concession. Had they any claim upon the Government for a new concession; or were the latter bound to take over the plant and materials in store? He also expressed disappointment at the Chairman not having referred to the matter which he brought to the attention of the Board two years ago—that was, the appointment of some person to go out to inspect the works, and look into the Company's affairs. If this had been done, he was convinced that they would now have been nearer completing a new concession with the authorities than they were.

Mr. NEWTON asked how much was due by Government and private consumers under the head of "Sundry Debtors in Pará, £9403."

Mr. SELLS inquired upon what ground the fines were arbitrarily exacted, seeing that they supplied gas of 15-candle power, as against the 10 candles required according to the contract.

The CHAIRMAN replied that the fines were levied for lamps being out and for deficiency in illuminating power. The custom in Pará, it appeared, was for the police officials to determine the latter by the eye; and the fines were exacted upon the *ipse dixit* of these men. They had actually been fined for lights being out where there were none existing. With regard to the concession, it expired in 1892; and it was very likely they would go on supplying gas without any contract at all, as was being done by the Company in Pernambuco. As to the dividend, it was impossible to give any earlier intimation about it, as they had only just received the telegram announcing the payment by the Government. As to Mr. Lambert's suggestion that a man should go out to Pará, he (the Chairman) referred to this at the last meeting. It was no use sending anyone out unless he was well qualified to do what would be required of him; and, to be of any good, he would have to remain there at least two or three months. The Directors found that it would be a difficult thing to obtain the services of a competent engineer to go to Pará for so long a time. With regard to the sundry debtors, there was owing for public and arsenal lamps £3087; for public establishments, £1986; for private lights, £1949; and for illuminations, £433.

The motion was then unanimously carried.

On the proposition of the CHAIRMAN, seconded by Mr. T. RUMBALL, a dividend at the rate of 7 per cent. per annum, less income-tax, was declared on the £5 per share called up on the preference shares.

The retiring Directors (the Chairman and Mr. Rumball) and the Auditor (Mr. Phillip Crellin) having been re-elected, the proceedings terminated with a vote of thanks to the Board.

ODESSA WATER-WORKS COMPANY, LIMITED.

An Extraordinary General Meeting of this Company was held last Wednesday, to receive a statement from the Committee appointed, at the meeting held on Oct. 29 last, to investigate the Company's affairs, and to report to the shareholders. Sir PETER SPOKES presided.

The notice convening the meeting having been read,

The CHAIRMAN briefly referred to the object of the meeting, and said that the Committee had arrived at a point in their deliberations when they were able to make a statement to the shareholders, but they were not yet in a position to present a final report.

Sir JAMES C. LAWRENCE, Bart., acted as spokesman for the Committee. In the course of his remarks, he said that the Company's concession was granted on Dec. 31, 1870, to Schwaben and Moore for 49 years from the completion of the works, with a guarantee of a certain revenue from the Municipality of Odessa. On March 22, 1872, the works were transferred to the present Company; and, in the following May, an official notice of the transfer was given to the Municipality. Two years were allowed for the completion of the main portions of the works, after approval of the plans by the Municipality. Water was brought into Odessa on Nov. 19, 1873—only ten weeks after the time named in the concession—notwithstanding numerous delays by the Municipality in passing the plans. A congratulatory telegram from the Mayor was received the same day, in which he thanked the Company for the energy with which they had carried out the works; and he assured them that he should be happy to assist in every way in maintaining the good understanding between them and the town. As an indication of this "good understanding," a notarial protest was sent by the Municipality on Dec. 7, to the effect that two months had elapsed beyond the time allowed for the completion of the works, and the Company were therefore liable to very heavy penalties. On May 21, 1874, the Municipality decided to send another protest to the effect that the concession was cancelled, and the caution-money confiscated. This protest, however, was never delivered by the governing body of the Municipality—the Uprava—who were subsequently thanked by the Municipality for withholding it. As, however, protests continued to be sent, to the effect that the works had not been completed according to the concession, it was arranged that a Special Commission should be appointed by the Municipality to examine all the works in detail. This Commission reported that the entire works were in accordance with the terms of the concession, and were constructed of good and solid material. On Sept. 7, 1874, the whole of the works were completed, at an enormously increased cost, two days before the time named in the concession. On the evening of the same day, when it was officially notified to the Municipality that the works were completed, they passed a resolution instructing the Uprava to communicate to the Company that the Municipality considered: "(1) That the contract was cancelled on March 9 last, and the caution-money confiscated. (2) As the term of six months granted by the concession to take away plant has since elapsed, the town considered the land, works, and material their property, without any compensation to the concessionaires." It was difficult, said Sir James, to find language strong enough to apply to this conduct, when it was remembered that a Special Commission appointed by the Municipality had reported that the works had been completed in accordance with the concession, and when it was known that the works had been finished two days before the time stipulated. On Jan. 17, 1875, a supplementary concession or agreement was made. This ought never to have been agreed to, as it removed some of the safeguards of the Company. But, as one of the old Directors told him (Sir James), they were threatened with litigation; and these were the best terms they could obtain, and an obligation to lay an additional main was removed. In an address by the Minister of the Interior to the Municipality on June 24 of the following year, he advised them, for the sake of public utility, not to let the Company fail. The Minister also made a report to the Emperor, in which he stated that the Company's difficulties had mainly arisen from a desire on the part of certain persons at Odessa to reduce the Company to a state of insolvency, in order that they might be able to purchase the works at a nominal price. He also referred, in the strongest language, to the intriguing and unseemly manner in which the Company were being treated; and concluded by saying that he hoped the language he had used on the subject at Odessa would result in putting an end to such a state of things. The Emperor noted in the margin of the report, "I hope so." The Minister of the Department who sanctioned the concession had openly declared many clauses to be unjust; and he said that, if attempts were made to enforce unjust conditions, it might be necessary for him to interfere. Up to Dec. 31, 1878, the revenue from the works had not been sufficient to meet

expenses; and in accordance with the concession, the Municipality had to contribute towards the guaranteed amount no less than £51,374 during the five years that had elapsed. The whole of this sum, however, was repaid to the Municipality in the seven years ending on Dec. 31, 1886. In 1881, the floods of the Dneister were unusually high; and for a few days, the water was slightly turbid. For this the Municipality claimed 105,000 roubles, or more than £10,000—nearly the whole of the available income for the year. Besides these numerous difficulties, water had been supplied to the garrison for some years; but since December, 1887, the Government had declined to pay for it, although the Law Courts had decided that they were bound to do so. The amount now due under this head was about £12,000. However, the two main points which had to be considered were the claim of the Municipality for an additional main from the Dneister, and the difficulties thrown in the way of the Company in carrying out their operations. With regard to the new main, the Directors laid the case before Dr. Aspland, Q.C., who was of opinion that the supplementary concession got rid of any such claim on the part of the Municipality; and he advised the Company to resist the demand. The present main pipe had a capacity of more than 3 million vedros; while the total daily demand in 1889 was less than 1½ million vedros. By the original concession, the Company were only bound to provide works sufficient for 2 million vedros. With regard to their consumers, by the concession the Company had no right to cut off supplies in cases where persons did not pay; and at the present time they had about 1000 actions going on to recover payment. The law expenses of the Company, he mentioned, amounted to nearly £16,000. The duty paid on stores sent out was £4190; and the outlay on new works out of revenue was £36,000. In conclusion, he said that the Committee were desirous of having an interview with the Company's Engineer (Mr. Platts), before submitting any definite report; and they also wished to have before them the results of the past year's working. Mr. Platts was very sanguine as to the prospects of the Company; and he himself thought they were promising, but it would be necessary to have the concession modified.

A resolution was then passed, on the motion of Sir J. LAWRENCE, seconded by Mr. FRANCIS, adjourning the meeting to the annual meeting in April, or to some earlier date, in the discretion of the Committee.

MANCHESTER CORPORATION GAS SUPPLY.

Alderman King on the Profits of the Undertaking—Complaints of Impure Gas.

The discussion which has been going on in the Manchester papers on the questions of the profits of the Corporation gas undertaking and the supply of gas at cost price has received an addition from the pen of Mr. Alderman John King, whose knowledge of the affairs of the Gas Department is well known. His main object in writing was to show that no unreasonable profit is being made on the gas supply; and that there is no probability of a further reduction in the price. The letter is as follows: There are several interesting and important questions pending in relation to our gas undertaking, about which the public have but little clear information. (1) There is the charge for depreciation in the revenue account—that is, charging each year's revenue with the estimated loss in value of the plant, the correctness of which is called in question by Mr. Murray by notice of motion in the Council. (2) There is the proposal to cease deducting this item for a time, in order that the city fund may be able, with less pressure on the rates, to meet the extra charge resulting from the Thirlmere water-works until these works are remunerative. (3) There is the question as to the sale of gas at cost price, by which the whole benefit of the works would be given to the consumers, and nothing to the ratepayers, who find the money and the management and have the responsibility. (4) The question whether the profits are excessive and unreasonable, and whether the price consequently should be reduced. In this letter I purpose addressing myself to the two latter questions especially. The popular belief that there is a very large and unjustifiable profit made by our gas-works is no doubt answerable for the war cry, especially at election times, for "a reduction in the price of gas." This cry remains the same whatever be the price. It existed when gas was 5s. per 1000 feet, and has continued since that time irrespective of the various reductions in price, and is still the popular cry with 20-candle gas at 2s. 6d. per 1000 feet. That the idea has, at the present time, no foundation in fact, I will show by reference to our last year's report. The net profit from the manufacture and distribution, &c., of gas for the year ending March, 1890, at 2s. 6d. per 1000 feet (after deducting 6d. per 1000 extra paid by outside townships, and which is, of course, no burden to the city gas consumer, and adding the value of the gas used for street lighting, not included in the account) was about £75,000. Out of this £75,000 all interest has to be paid, and from it nothing has been deducted for sinking fund. The capital employed in the undertaking, valuing the plant at its estimated real value, is about £1,600,000. This is the amount as shown very clearly in the accounts. On this capital the profit of £75,000 will pay 4¾ per cent. Seven per cent., which is a low dividend for gas-works, would require £112,000 profit; and even 6 per cent. would require £90,000, or £15,000 more than the profit made. After receiving this amount of £75,000, there would be for the city rate to pay the interest on borrowed money (say), £28,000; the sinking fund, £23,500; and there would also be the street lighting, £28,000. This capital of £1,600,000 is the amount which the ratepayers of the city at large, and not those ratepayers only who are consumers of gas, have provided and invested in gas manufacture, partly from their own and partly from borrowed money. Much has at times been said as to the large price for which the gas-works could be sold. From the foregoing figures, if the buyer were tied to sell at our price of 2s. 6d. per 1000 feet of 20-candle gas, what would such buyer give for the business, producing £75,000 per annum and no more, out of which his profit or dividend had to be provided? If he gave £1,600,000, the price at which the concern stands in the books, he would not realize 5 per cent. on his capital. This shows the random character of the statements as to the sale value. Various amounts have been named, even up to £3,000,000. Of course, this profit is on the presumption that the assets are not valued at more than they are worth, and that profit and loss account is debited with an amount needful to replace the plant when worn out. The figures given in this letter should satisfy anyone who will consider them that no unreasonable profit is being made on the gas-works, and that there is no probability of further reduction in price. It has been suggested by some sanguine people that the gas could be reduced 6d.—to 2s. per 1000 feet. As every penny in price means £12,000 per annum, the absurdity of the suggestion does not need emphasizing. It has been said, I am aware, that a large increase of sale, and even of profit, would arise from a large reduction in price. Past experience has, however, shown the fallacy of the former expectations; no exceptional increase in consumption having arisen when reductions have been made, and of course no increase of profit has resulted.

Some correspondence appeared last week in the *Manchester Guardian* complaining of the "bad smells" emitted by the gas supplied in the city on Tuesday. Writing under the *nom de plume* of "Lux," one writer said: "If the Manchester gas is even occasionally so vile as it was last night, it is quite necessary to warn people against using it. The air of a large room became suffocating with sulphurous acid within half an hour after the gas was lighted. I then tested the gas with lead paper in another room, and found that this blackened instantly; and the stench of sulphur from the gas was such as to be perceptible twelve hours afterwards, although the window had been kept open. Knowing that the Manchester gas always contains large quantities of sulphur, I burn oil in its place whenever possible. I positively dare not consume the gas any longer unless a guarantee is given against the possibility of the recurrence of such a state of things. I think it is high time the Gas Committee held a full inquiry into the sulphur question." Mr. J. Thompson asserts that during the whole of Tuesday, complaints were made at his works of sickness and offensive smells, which it was discovered was caused by the gas. Mr. H. C. Sacre averred that the gas was "simply loaded with sulphuretted hydrogen;" and he considered that it was "scandalous" the Corporation should supply such a "vile compound" to the consumers. In a subsequent issue of our contemporary, the cause of these "bad smells" was explained. It appears that a short time ago there was an accident at one of the works, by which some unpurified gas was passed into the mains in the southern portion of the city; and it is only the gas flowing through those mains which continues to give off an offensive odour. However, it is believed this will soon disappear.

The Recent Convictions for Intimidation at Plymouth.—The Recorder of Plymouth (Mr. H. M. Bompas, Q.C.) has prepared a case for the High Court of Justice, arising out of the points of law involved in his recent judgment on the strike appeals, reported in the JOURNAL for the 20th ult., p. 114. This does not mean that a case will necessarily be granted, for the point as to the Recorder's jurisdiction has yet to be considered in open Court; no application having been made for a case at the time the judgment was delivered.

Hull Corporation Electric Lighting Committee and Electrical Contractors.—The members of the Electric Lighting Committee of the Hull Corporation recently had under consideration an application from Woodhouse and Rawson United, Limited, for permission to put down an installation for lighting by electricity a large block of buildings. In their letter, the firm stated that the plant they were prepared to lay down would be capable of extension to the whole district so far as private consumption was concerned—that was to the old town. The Chairman (Mr. Holder) remarked that the block of buildings it was proposed to light included banks and business houses, which would take a large supply, supposing the Corporation were doing it themselves. The application raised a very important question. It was whether they were to permit these people to take the plums out of the Corporation's own system, and so militate against the success of a general scheme if they were to adopt it. It was also questionable whether the Board of Trade would allow them to transfer their powers in this way. In reply to a question, he added that the firm could, if they had a piece of land, put down an installation in spite of the Corporation. It was moved, and unanimously agreed, that a reply be sent to the effect that the Committee were not in a position to entertain the application.

The Cost of the Cardiff Corporation Taff Fawr Water-Works.—The speech made at the recent meeting of the Cardiff Town Council by Mr. Trounce on the question of the cost of the new water-works for the borough (*ante*, p. 122) has led to some correspondence between him and the Engineer of the works (Mr. J. A. B. Williams), who thinks that the remarks reflect rather seriously on him. Mr. Trounce stated that the estimate for the Taff Fawr supply was £213,882; but Mr. Williams points out that this was the figure given in his "preliminary" report for only one portion of the scheme. His "parliamentary" estimate for the whole of the Taff Fawr works was £373,000, and for the first section (called Scheme B) £240,749. He also says that Mr. Trounce was quite in error in supposing that the first section of the Taff Fawr works, as sanctioned by Parliament, and now nearly completed, was estimated to supply 5 million gallons per day for town use. The quantity stated that would be available was 3½ millions. As to the delay in completing the Cantreff reservoir, Mr. Williams reminds Mr. Trounce of the great difficulties they had with the late contractor, and says that every reasonable effort was made to push on the work. With regard to the commission of 4 per cent. paid to him as Engineer of the works, Mr. Williams states that, had he known that his expenditure would have reached, to Dec. 31 last, the sum of £8426 19s. 9d. with a further probable outlay of £775 at least in the next eighteen months to complete the work, he certainly would not have undertaken it on these terms; and had the works been completed in five years, as at first anticipated, instead of extending over a period of about eight years, he would have saved at least £2500 in staff expenses. In a reply to this letter, Mr. Trounce says, referring to the parliamentary estimates for the new works, that even if they be accepted, they are very wide of the actual payments; and he concludes by remarking that, if his inquiry into this question elicits information, expedites the completion of the works, and minimizes the costs, he will not have called attention to it in vain.

METROPOLIS WATER SUPPLY.

Reports by the Engineer of the London County Council (Mr. A. R. Binnie, M. Inst. C.E.) on New Sources of Supply.

One of the first acts of the Special Committee on Water Supply and Markets of the London County Council, on re-assembling after the summer recess, was to instruct the Engineer (Mr. A. R. Binnie, M. Inst. C.E.) to submit to them a report indicating the heads under which it was desirable to obtain evidence at the inquiry proposed to be held by the Council on the subject of the water supply of London. A week after receiving his instructions, Mr. Binnie complied with them, and presented a long report, which was followed a few weeks later by an appendix. The two documents have at last been printed; and by the courtesy of the Clerk of the Council (Mr. De la Hooke), we are able to reproduce the principal portions of them.

In attempting to comply with the Committee's request, Mr. Binnie thought it would be most convenient to briefly direct attention to a few of the salient points connected with the present works of the London Water Companies; and he said that as any views of what might be required in the future must be based to a large extent upon the experience of the past, he proposed to compare the recent state of affairs with the circumstances existing from 1867 to 1869, at the time of the inquiry held by the Duke of Richmond. He did this more particularly because this was the last great investigation into the whole question, and because he believed that the Commission over which the Duke presided was the first authoritative body who, after long and careful consideration, recommended that "the future control of the water supply should be entrusted to a responsible public body, with powers conferred on them for the purchase and extension of existing works; and for levying the rates." For the purpose of making his comparison, Mr. Binnie drew up three tables—the first showing the condition of affairs in 1867; the second giving engineering and financial statistics of the Water Companies for the year 1888 (the former derived from the work of the late Colonel Sir F. Bolton, and the latter compiled from the table prepared by Messrs. Alfred Lass and Co. for the water inquiry by the Corporation of London last summer, and appended to the evidence given by Mr. S. Wood, a member of the firm); and the third showing the financial position of the Companies in 1872-3.

According to the first table, the total capital of the Companies in 1867 was £8,769,515; the area supplied being 224½ square miles in extent, containing 441,442 houses and 3,100,000 persons, to whom an average quantity of 98,600,248 gallons of water a day was afforded, at a rate of (say) 31·8 gallons per head. It is pointed out, however, that the supply in summer, during the months of June and July, rose to 108,312,909 gallons a day, or an increase of about 10 per cent. Of the total quantity delivered daily, 49,042,467 gallons were taken from the Thames, 43,088,908 gallons from the basin of the Lea, and 6,468,873 gallons from the chalk wells of the Kent Company. From the second table we find, as a summary of all the Companies, that collectively they are empowered to draw, as a maximum, 130 million gallons daily from the Thames—being an increase of 20 millions a day as compared with the figures of 1867; and that their powers to draw from the Lea and from chalk wells remain, as in 1869, unlimited. The average daily quantity drawn from the Thames in 1888, was 76¼ million gallons, as compared with 49 million gallons in 1867—an increase of 27¼ million gallons, or (say) nearly 56 per cent.; from the Lea and other sources, they drew 77¾ million gallons in 1888, as compared with 49½ million gallons in 1867—an increase of 28¼ million gallons, or (say) 57 per cent. The total quantity of water derived from all sources in 1888 was 154 million gallons, as compared with 98½ million gallons in 1867—an increase of 55½ million gallons, or 56⅓ per cent. These, however, are only average figures; and in the summer months the quantity must be much greater. (Mr. Binnie states in a foot-note that, in the returns laid before the County Purposes Committee of the Court of Common Council during their recent inquiry, the average daily supply for the year 1889 was given as 166,942,483 gallons; and according to the Official Water Examiner, the average daily supply during June, 1890, was 185,376,080 gallons.) With regard to the increase from 98½ million gallons in 1867 to 154 million gallons in 1888, it is interesting to refer to the estimate of future requirements made by the Duke of Richmond's Commission, who said that "200 million gallons per day is the highest demand that need be reasonably looked forward to for the Metropolitan supply."

Mr. Binnie's second table shows that the total population supplied has risen from 3·1 millions in 1867, to 5·5 millions in 1888—an increase of 2·4 millions, or 77·4 per cent. Dividing 154 by 5·5, Mr. Binnie gets 28 gallons per head in 1888, as compared with a supply of 31·8 gallons per head in 1867. This, he remarks, was to be expected under the improvements effected by constant supply, which is always more economical, and which had been applied to 382,214 out of a total of 734,406 houses returned as supplied with water in 1888. With regard to this increase of population to 5·5 millions actually supplied in 1888, he calls attention to the fact that the Royal Commission of 1869 said that "a probable increase of population to 4·5 or 5 million may have to be provided for, though we believe that the time for such an extended provision will be very remote." To afford this supply in 1888, engines to the extent of 20,701-horse power were required; and the water was filtered through 100½ acres of filtering-beds, and distributed through 4545 miles of pipes. Turning to the financial side of the second table, we find that the total amount of share and loan capital authorized in 1888 was £15,383,774, and that actually employed was £14,554,813. As compared with the £8,769,514 in 1867, the latter shows an increase of £5,785,299, or (say) 65·9 per cent.—a rate 9½ per cent. greater than that of the quantity delivered. The total income of the Companies amounted in 1888 to £1,746,510; while the total annual expenditure was £647,841, or 37·1 per cent. of the total receipts. The net profits for 1888 are given as £927,502; and the dividends paid, £903,682. Consequently, the dividends appear to represent about 6·2 per cent. return on the capital of £14,554,813. The rate of interest varies from 8·98 per cent. per annum in the case of the Kent Company, down to 2·9 per cent. in that of the Southwark and Vauxhall Company.

With regard to the third table, it shows that the total dividend paid by the Companies in 1872 was £531,558, which, as compared with the £903,682 paid in 1888, indicates an increase of £372,124, or (say) 70 per cent. in dividends paid in 16 years, as compared with an increase of capital in 21 years of 65·9 per cent. But perhaps this, and the fact that a larger dividend appears to have been paid in several years than the amount of the net profit, may be capable of explanation on further inquiry.

Mr. Binnie thinks the result of the foregoing comparison is to show that the estimates of probable increase, both as regards population and quantity supplied, made in 1867, were far too low; but this, he fears, is no novelty in municipal water-works, as the history of most of those carried out in this country is a record of such under-estimates, with the consequent, and often costly, extension of the works, because they had not at first been laid out on a sufficiently large scale, or with a view to any gradual extension. He adds that, generally speaking, the whole question is very large—requiring on many points very careful investigation and inquiry; but certainly the above figures, or others of a similar nature, but more in detail, and brought up to date, will afford valuable data on points which were obscure in 1869.

In the next section of his report, Mr. Binnie deals with the subject of the future increased supply to be obtained from the Thames, the Lea, and wells sunk in the chalk. In 1869 the authorized maximum daily supply from the Thames was 110 million gallons; that derived from the Lea and from chalk wells being unlimited. The Royal Commission thought the quantity drawn from the Thames might be doubled, if required, with proper provision for storeage. Their opinion was, however, based on an extreme dry-weather flow of 350 million gallons a day at Teddington. According to the records of the flow of the river for the summer months of the dry years 1885 and 1887, the average for August, 1885, was 210 million gallons a day, falling as low as 166 million gallons; and that for August, 1887, 240 million gallons a day, falling as low as 154 million gallons. Mr. Binnie had no means of telling how much the Companies were pumping from the Thames at those periods; but assuming it was 10 per cent. above the average supply, as was estimated by the Royal Commission of 1869, it would amount probably to something like 84 million gallons. (The average daily quantity taken from the Thames during the month of June, 1890, was, according to the report of the Official Water Examiner, 97,707,062 gallons.) On this assumption the average total flow of the Thames at Teddington, in August, 1885, would be 294 million gallons, of which 84 millions, or 28½ per cent., were abstracted; but it fell during that month as low as 250 millions, which would show an abstraction of 84 million gallons, or 33·6 per cent. In the same way during the month of August, 1887, we get an average of 324 million gallons, of which 84 millions, or 25·9 per cent., were abstracted; but in this month, on more than one occasion, it fell to about 238 millions—showing an abstraction of 35·3 per cent. These figures, Mr. Binnie thinks, go some way to explain the bad state of the river in those years; for it must, he says, be kept in mind that the purity of the fresh water portion of the Thames above Greenwich is entirely dependent on the flow over Teddington Weir. Such a state of things as those figures disclose—viz., the taking away from an important river from one-third to one-fourth of its total volume in the height of summer, and without affording one drop of compensation water—he hardly thinks would be allowed by Parliament in the case of any of the large municipal towns, when supplying water, not for profit, but in the strict performance of a public duty. Coming to the River Lea and the wells in the chalk, Mr. Binnie quotes at some length from the report of the Royal Commission already referred to, and then gives the conclusions arrived at by the Commissioners on the subject of increased supplies from the three sources. They were to the effect that, if ever the Metropolis should increase to such an extent as to render necessary so large a supply, and to justify the outlay for works necessary to obtain it, one might reckon on getting 220 million gallons a day from the main stream of the Thames, supplemented by storeage reservoirs, 50 million gallons from the Lea, and 30 million gallons from the chalk to the south and south-east of London—making a total of 300 million gallons. Mr. Binnie thinks it is clear that this quantity, at the rate of 30 gallons per head, would suffice for a population of 10 million persons; but, as stated, it can only be obtained by the construction of extensive impounding reservoirs in the upper valley of the Thames, to store the excessive flow of wet against periods of dry weather. In this connection, he points out that one very important feature in which all the works which supply London differ from those constructed by large municipalities in other parts of the country is the absence of any supply of compensation water to be sent down the rivers, in consideration of the quantities abstracted from them for the supply of the Metropolis. Mr. Binnie considers it to be partly due to the fact that the London Companies have never been called upon to give compensation in water, that they have been able to maintain so favourable a financial position as compared with other large municipal water-works; and he says it becomes a grave question of inquiry, should the Council become the possessors of the existing works, and attempt to increase the supply as suggested by the Royal Commissioners, whether Parliament would not require them to give compensation in water. This should be borne in mind in fixing the value of the existing works, as neither the Companies nor the Council could very largely increase the present supply without constructing some such impounding works as those suggested by the Commission.

Having dealt with the quality of the water supplied to London, which he acknowledges, although with some reserve, to be "fairly good and wholesome," Mr. Binnie discusses the merits of hard and soft water; and then briefly mentions the subject of constant service—remarking thereon that any future or extended supply must be on this system, which, as a matter of fact, has already been adopted to a very large extent. He next gives an outline of the additional information required to form an opinion on the present supply, and its possible extension from the Thames, the Sea, and the chalk. It comprises the following: (1) Statistical information of the finances, working, &c., of the Water Companies, so as to bring the figures up to date. (2) The question of the possible danger to the health of the Metropolis in case of an outbreak of severe infection or contagious disease in any of the towns draining into the Thames above Hampton or Sunbury.

(3) The probability of Parliament requiring compensation water to be sent down the river, should any large scheme of storeage reservoirs be adopted. (4) Complete statistics of the rainfall of the Thames and Lea Valleys, as well as of the chalk downs, both to the north and south of London; also, if possible, the flow of the Rivers Thames and Lea as registered at one or two points, so as to determine the relation existing between the rainfall and the flow of these rivers. (5) An inquiry into the geology of the Thames and Lea Valleys generally, as well as into the structure of the country, as it affects the flow of water from the surface or beneath it to form springs to supply wells, and the retentive or water-tight nature of certain parts of the Thames Valley rendering them suitable for the formation of reservoirs. (6) A careful survey of the Thames Valley, to determine on the best scheme of reservoirs, conduits, and other works required to bring in an increased supply from that river, with an estimate of the probable cost of the works. Should these inquiries turn out so unfavourable as to render it advisable to abandon the Thames and Lea as sources of supply, or should the available supply require to be supplemented, or should it be considered unadvisable to construct impounding reservoirs on the Thames, but to supplement the present supply from some other locality, the question will arise, What other sources of supply are available? This is the question which next engages Mr. Binnie's attention; and this part of the report we give in full, as follows:—

If it be considered necessary to introduce any new supply, the quantity required to be provided is so large as to render wells and pumping almost out of the question, except as an auxiliary to some other project. Consequently, as we must, before all things, obtain a supply unimpeachable on the question of quality, it will be necessary to resort to some comparatively uncultivated area on which there is a heavy rainfall, as the amount of the latter will largely affect the size and cost of the works. Such areas are only to be met with among the higher hills and mountains of this country, in Cumberland, Wales, and Devonshire, where the rainfall amounts to from 60 to 100 inches per annum, as compared with (say) 27 inches, on an average, in the Thames Valley. Consequently, we find that some or all of these localities have been from time to time suggested as possible sources for the supply of the Metropolis, and are gradually being appropriated by other large towns. By thus resorting to high hills for a supply, it may with great advantage be brought in by gravitation, and so avoid the necessity of keeping up a supply by pumping, except to a few very high-lying localities. Without attempting to deal with all that have been spoken of, I will direct attention to a few of the most important, and which are certainly first worthy of careful attention and inquiry.

Welsh Scheme from the Upper Severn.—This scheme was first suggested by the late Mr. J. F. Bateman, F.R.S., the well-known Engineer of the Glasgow, Manchester, and Thirlmere Water-Works, as far back as 1865. He proposed to derive the supply from a total catchment area of about 204 square miles, or (say) 130,500 acres, on the tributaries of the upper parts of the Severn above Welshpool, Newtown, and Llanidloes, known as the Vyrnwy, Banw, Carno, Tyrannon, Clywedog, Tylwch, &c. The flow from this area was proposed to be stored in seven reservoirs of a united capacity of 6709 million cubic feet, or 41,932 million gallons, and from which he proposed to obtain 230 million gallons per day for the supply of London, after giving out as compensation to the streams 73 million gallons a day; these calculations being based on an average annual rainfall of 75 inches, of which 36 inches would be available for supply and compensation. But he also pointed out that, if required, the supply could be increased to 300 million gallons a day. The water as tested by Mr. Bateman, and afterwards by the Royal Commissioners, was found to be of good quality; containing only 2¼ to 4½ grains of solid matter per gallon, little organic matter, no traces of pollution, and having a hardness of 1° to 2°.

Mr. Bateman proposed to convey the water to London in a conduit starting at a level 450 feet above the sea, which, passing by way of Marten Mere, near Montgomery, and the towns of Bridgnorth, Stourbridge, Henley-in-Arden, Warwick, Banbury, Buckingham, Aylesbury, Tring, Berkhampstead, and Watford, would, after a course of about 180 miles, terminate near Stanmore at an altitude of 270 feet above the sea. At Stanmore he proposed to construct service reservoirs of a capacity of 2000 million gallons.

Mr. Bateman's estimate was based on the works being carried out in instalments, as the requirements of the Metropolis might necessitate; the expenditure being spread over four periods, as follows:—

Instalments.	To supply Million Gallons per Day.		Cost.
First	130	..	£8,685,006
Second	170	..	10,571,615
Third	200	..	10,822,474
Fourth	230	..	11,400,023

The practicability of carrying out a scheme in this district, as to the construction of reservoirs, the quality of the water, and the advantage of going to a great distance to procure a pure, wholesome, and uncontaminated gathering-ground, has since been proved by the fact that the City of Liverpool has obtained parliamentary powers, and has constructed works, under Mr. T. Hawksley, C.E., F.R.S., and Mr. G. F. Deacon, C.E., to take the water of one of the identical streams proposed—viz., the Vyrnwy—and convey it a distance of about 66 miles to Liverpool. This Liverpool scheme, by deducting some 18,000 to 20,000 acres of gathering-ground, reduces by this amount Mr. Bateman's proposed area of 130,500 acres; but sufficient still remains, and can be added to and increased, if required to meet the demands of the Metropolis.

Welsh Scheme from the Upper Wye.—This scheme was, I believe, first projected by the late Mr. H. H. Fulton, C.E., and brought before the Royal Commission in 1867. He proposed to appropriate a gathering-ground of about 440 square miles, or 281,600 acres, on the Upper Wye above Hay, Builth, and Rhayader, extending to the slopes of Plynlymmon. This district, with an average annual rainfall of 60 inches—of which 30 inches would be available—Mr. Fulton calculated would yield a supply of 393 million gallons daily for London, and give 131 million gallons a day as compensation; but in the first instance he only proposed, by the construction of six reservoirs, to bring into London 230 million gallons a day. His proposed conduit commenced near Rhayader, at a height of 590 feet above the sea, and passed near Glasbury, Hay, Kington, Ludlow, Tinbury, Bewdley, Stourport, Bromsgrove, Henley-in-Arden, Warwick, Banbury, Tring, and Watford, to a point near Barnet, where it terminated at an altitude of 276 feet above the sea-level. His estimated cost was, for 130 million gallons a day, £7,000,000; and for the remaining 100 million gallons, £2,000,000—a total of £9,000,000 for 230 million gallons daily.

There can be no doubt that this district yields water of great purity, its drainage areas are uncontaminated, and it was favourably reported on in 1871 by Sir R. Rawlinson, K.C.B., as a suitable source for the supply of Birmingham; and from some years' residence in the centre of the district, I can bear my testimony to the suitability of both this and the Upper Severn as sources of supply for London.

Cumberland Lake Scheme.—This scheme was brought before the Royal Commissioners in 1867-69 by the late Mr. G. W. Hemans, C.E., and Mr. R. Hassard, C.E. These gentlemen proposed to appropriate Lakes Thirlmere, Ullswater, and Haweswater with a united gathering-ground of 177 square miles, or 113,280 acres; and, by embanking the lakes, to form reservoirs to contain 5563 million cubic feet, or 34,658 million gallons. With a total annual rainfall of from 80 to 100 inches, and an available 50 inches, they calculated on a supply for London of 287 million gallons daily, after giving 63 million gallons a day for compensation. The conduit starting from Ullswater would be 270 miles in length, terminating in large service reservoirs of 3750 million gallons capacity, situated near Edgware. The total estimate for the work was put at £13,500,000. As in the case of Mr. Bateman's Welsh scheme on the Upper Severn, so in this case also, the practicability of the works, the suitability of the uncontaminated gathering-ground, and the consequent purity of the water, has led the city of Manchester to obtain powers for the appropriation of Thirlmere; the works being designed for them, to deliver 50 million gallons of water a day, by Mr. Bateman, and are now in course of being carried out, including conduits over 100 miles in length, to convey the water to Manchester, by Mr. G. H. Hill, C.E.

Devonshire Scheme.—Finally, I would direct attention to Dartmoor as a possible source of future supply, the examination of which might be undertaken. I am not aware that it has been before suggested as a source of supply for the Metropolis; but its elevation, heavy rainfall, and clean granitic gathering-ground, make it a site where good water could be obtained, and its distance from London—some 180 to 200 miles—is within reasonable limits.

One great advantage of any of these schemes is that they would bring in a supply by gravitation without pumping, and deliver it at an altitude of some 270 feet; that is, approximately 80 feet above the reservoir of the West Middlesex Company near Primrose Hill, 30 feet above the top of the Monument, 28 feet above the top tower of Westminster Abbey, and about 240 feet above the level of the Thames, from which the supply is now pumped. So that not only would the water be brought from Wales, Cumberland, or Dartmoor by gravitation, but delivered over almost the whole of London under constant pressure without pumping; the only exceptions being districts immediately around the Hampstead, Highgate, and Sydenham Hills, the extreme summits of which rise to altitudes of 441, 424, and 370 feet respectively. How important an expense pumping is, under existing circumstances, may be judged of from the fact that I find that the eight Companies who supply London expended in 1879, according to the figures given in the inquiry on the London Water Supply in 1880, a sum of more than £118,000; and this was quite independent of storeage, filtering, or interest on capital, and represents, at 20 years' purchase, £2,360,000. Of course this charge must be greater at the present time.

Mr. Binnie next considers the remarks of the Royal Commissioners of 1869 on these gravitation schemes generally, and then concludes by saying he has endeavoured to point out some of the more salient features of the water question, and to indicate to the Committee both directly or by implication, those subjects which he considers deserving of their careful attention and inquiry. He thinks it would be well if all the circumstances—meteorological, geological, chemical, and medical, as well as those of an engineering nature—connected with the two Welsh projects on the Severn and Wye, either as separate schemes or as a combined undertaking, be first inquired into. This might be carried on independently, but at the same time with that of the Thames and Lea basins, as circumstances might arise under which it would be prudent for the Council to be prepared with an independent plan entirely separated from the existing works.

In an appendix to his report, Mr. Binnie gives a tabular statement, with remarks thereon, of the amount of compensation water required by Parliament to be sent down streams, in consideration of that abstracted for the supply of towns, in the cases of Glasgow, Manchester, Liverpool, Leeds, Halifax, Ashton-under-Lyne, and Bradford. These places were selected by him, among many others, as typical of the different modes in which Parliament has dealt with this branch of the subject.

The Metropolitan Vestries and District Boards and the Water Question.

Our readers are aware that, on the invitation of the Vestry of St. James's, Westminster, a conference of representatives of Metropolitan Vestries and District Boards took place in June last year to consider the question of the water supply of the Metropolis. The result, it will be remembered, was the appointment of an Executive Committee (with Mr. Harry Wilkins, Vestry Clerk of St. James's, as Honorary Secretary) to deal with the matter—their expenses to be defrayed by contributions from the various authorities. The Committee have just published an account of their proceedings in the form of a "Memorandum," of which the following is an abstract:—

It is first of all pointed out that London stands alone, among all the large towns in the kingdom, in being dependent for its water supply upon Companies, although two Select Committees—Mr. Ayrton's in 1867, and Sir W. Harcourt's in 1880—have reported in favour of the supply being placed in the hands of a representative authority.

Allusion is next made to the Bill promoted by the late Metropolitan Board of Works in 1878, and that of the Conservative Government in 1880, neither of which passed. From the latter date until last year, no serious attempt was made to transfer the water undertakings of the Metropolis to a public body. The approaching quinquennial valuation of property, with the prospective increase in the charge for water consequent on raised assessments, roused the Local Authorities to action; the result being the conference above mentioned, which took place on the 19th of June last. At this meeting it was resolved to request the Government to introduce a Bill to "enable the London County Council, or some other representative body, to acquire the undertakings of the eight Water Companies now supplying London, or some of them, by agreement, or, failing agreement, to create a Board of Arbitrators to settle the terms of transfer by compulsory powers, or to give power to establish an independent supply." Consequential resolutions were passed; and a deputation subsequently waited upon the President of the Local Government Board (Mr. Ritchie), to seek his good offices with the Government, in the hope that a Ministerial measure dealing with the subject of the water supply of London might be the outcome of the interview. Mr. Ritchie admitted that the question was not in a satisfactory condition; and he expressed the opinion that the only perfect solution was to be found in the transfer of the water supply to a public body. He instanced, as an evidence of the goodwill of the Government, the conferring by Parliament upon the London County Council of power to expend a certain sum in investigating the question; and excused himself and his colleagues from taking action at that time by the prospect of the Council undertaking the contemplated inquiry, and by a similar one by the Corporation of London then actually in progress. But as it was thought that the delay of even one year might mean the addition of a further burden to the water consumers, an adjourned meeting of the delegates was held on the 31st of July to consider the desirability of taking further action, when a resolution was passed to the effect that, as the London County Council had no power to introduce a Bill into Parliament for the purchase of the Water Companies' undertakings, the Vestries and District Boards should be advised (following the precedent set in the case of the gas legislation for the Metropolis) to unite in giving notice of, and preparing a Bill for such purchase, and for the power to set up a competing supply. This resolution was in due course communicated to each of the Vestries and District Boards represented, with a request that they would contribute towards the preliminary expenses of promoting the proposed Bill, and appoint a member to serve upon an Executive Committee to prepare the Bill. Altogether, 23 Vestries and District Boards appointed members to serve upon the Committee. Some abstained from co-operating, and two or three withdrew on four several grounds: (1) Because they desired the introduction of a competing supply without regard to existing undertakings; (2) because the City Corporation had announced their intention of promoting a Bill; (3) because they considered the London County Council should take up the work; and (4) because they did not feel disposed to commit themselves to expenditure. None of the Vestries or District Boards, however, expressed themselves as content with the existing condition of affairs. Having commented briefly upon the various reasons given for abstention or withdrawal, the Committee come to the Bill they have promoted, which, as will be seen by our "Parliamentary Intelligence," was presented and read the first time in the House of Commons last Friday. The fundamental principle of the Bill, which consists of 53 clauses and 7 schedules, is the acquisition of the undertakings of the existing Companies, and the supplementing of the present supply from two sources, north and south of the Thames respectively, which the Committee are advised will yield an additional supply of pure water equivalent in volume to not less than one-third of the present consumption. They then proceed to give an epitome of the measure, as follows:—

Constitution of the Water Authority.—This is a question of more difficulty than may at first sight appear. The area supplied by the Water Companies extends not only over the whole county of London, but into the counties of Kent, Surrey, Middlesex, Herts, and Essex. If London only were concerned, it might be urged that the London County Council should be the authority to take over the supply of water. Again, if the system of distribution were such as to allow the Council to supply water in bulk to the Local Authorities of the surrounding districts, at a price to be agreed upon from time to time, as is the case in many of the provincial corporate towns, the Council might be regarded as the natural Water Authority for the whole area, in consequence of the portion under its jurisdiction being more populous and more wealthy than the whole of the remainder. But the system of distribution is apparently too much interlaced among the various districts between the source of supply and the central area, to render any such course practicable. The only alternative seems to be a power of equal rating throughout the area of supply. And it is doubtful whether Parliament will confer upon one authority, such as the London County Council, power to levy rates for any purpose whatever within the jurisdiction of another constituted authority. This power to levy rates may become a matter of importance forty or fifty years hence, by which time, if not earlier, considerable expenditure will probably be necessary to further supplement present sources of supply, if not to open up a new source, or sources, altogether. This expenditure should, in equity, be spread over the whole area of supply; but the ratepayers in the outer ring may fairly object to be assessed for an expenditure by a body upon which they are not represented. Circumstances may, indeed, necessitate the raising of a rate at a very early period, if any unforeseen circumstance arises to render the public water supply not self-supporting. The question of rating and representation is, therefore, one of some importance, especially bearing in mind that the area under the jurisdiction of the London County Council is approximately 120 square miles, while the area supplied by the eight Water Companies is approximately 460 miles, although at present London far exceeds in point of population and rateable value the remainder of the area.

Alternative Proposals for a Water Authority.—Bearing in mind the desirability, on the one hand, of avoiding the creation of a new Public Authority in London, and, on the other, the justice of the plea urged by consumers in the outer ring for representation on the Water Authority, the Committee have deemed it best to frame the Bill in such a way that, after hearing such evidence as may be tendered, Parliament may either create a special authority or entrust the duty of water supply to the London County Council. For this purpose it is proposed by the Bill to create a Trust of 39 members, but to reserve to the London County Council power by resolution to undertake the duties imposed by the Bill on the Trust, and thus render the creation of the Trust unnecessary. It is not anticipated that the Bill will pass in this form; but the question is thus deliberately raised in an alternative form, so that Parliament, in its wisdom, may select either a Special Trust, or the London County Council as the authority to carry the Act into execution.

Constitution of the Trust.—The Trust, as proposed by the Bill, will be directly elected by the county electors within the Metropolitan water area—*i.e.*, by the persons entitled to vote in the election of members of the county councils. The number of members of the Water Trust will be one-half the number of members elected in the same area to represent the constituencies in the House of Commons. There appear to be 77 parliamentary boroughs and other electoral divisions within the area, returning 78 members to Parliament; the City of London electing two members, and the other boroughs and divisions one each. The Water Trust will therefore consist of 39 members, one elected by the City of London, and one by each combination of two parliamentary boroughs or divisions; the combination to be arranged by the Local Government Board. The election is to be held according to the rules regulating the election of members of the County Council, subject to such modifications (if any) as may be necessary to give effect to the Act; these modifications to be made by the Local Government Board. The first election is to be held on some day in February, 1892, to be appointed by the Board; and subsequent elections are to take place on the same day as the election of County Councils—*i.e.*, Nov. 1. The Chairman and two Vice-Chairmen will be salaried; but it is not proposed to pay the other members of the Trust. Provision is made for filling up casual vacancies; and rules are laid down in the last schedule regulating meetings of the Trust. Members will be disqualified from serving if they hold any office or place of profit under the Trust (other than that of Chairman or Vice-Chairman), or participate in the profits of any work done by order of the Trust, or are concerned in or participate in the profits of any contract entered into by it.

Duties of the Trust.—The purposes of the Act are defined as being to vest in the Water Trust the sole and exclusive power of supplying water within the Metropolitan water area for domestic, manufacturing, and general purposes; for maintaining in the mains a supply of water under pressure for high service and the extinguishment of fires; and for equalizing the charges for water supply throughout the Metropolitan water area. The Act is to be carried into effect by the acquisition of the undertakings of the eight London Water Companies, and of the undertakings of the Rickmansworth Water-Works Company, and the Leatherhead and District Water-Works Company. The undertakings may be acquired by agreement or arbitration; and the provisions of the Lands Clauses Consolidation Acts are incorporated with the Bill, subject to modifications. Until the transfer of the undertakings to the Water Trust, the Companies are to exercise their powers as Trustees for the Trust, and subject to a continuous audit; so that the Act will take immediate effect for the benefit of the water consumers. Certain powers are conferred upon the Trust, including power to promote Bills in Parliament for any purposes connected with the water supply, or the extension or improvement thereof.

Board of Arbitration.—It is exceedingly unlikely that the Trust and all the Companies will agree to terms of transfer without arbitration, although it is highly probable that arbitration in the case of the first of the Companies dealt with will result in the laying down of principles, rendering agreement with the other Companies a comparatively easy matter. Each undertaking will, failing agreement, necessarily be the subject of a separate arbitration. It is important that the same lines should be followed in each case. Instead of arbitrators being appointed for each arbitration, it is therefore proposed by the Bill to constitute a Board of Arbitration to settle all claims for compensation. This Board will consist of four members—one appointed by the President of the Local Government Board, one by the Chairman of the Institute of Bankers, one by the Chairman of the Institution of Civil Engineers, and one by the Surveyors' Institution. Failing appointment by any of these, the Home Secretary is to appoint an arbitrator or arbitrators. The nominee of the President of the Local Government Board is to be Chairman of the Board of Arbitration, with a casting vote in case of an equality of votes. Provision is made for the filling up of vacancies on this Board. In estimating the amount of compensation payable in respect of any undertaking, the Board of Arbitration are to have regard to the value of the undertaking prior to the introduction of the Bill into Parliament, and are not to take into consideration any claim for back dividends.

Purchase Stock.—The compensation agreed to be paid or awarded by the Board of Arbitration is to be paid in purchase stock; power being reserved to individual shareholders to claim payment in cash. A sinking fund must be commenced not later than twelve years from the passing of the Act; and the debt is to be extinguished within 80 years from the date of the creation of this fund. The sinking fund may be used to redeem the stock in the open market. Arrangements may be made with the Bank of England for the management of the stock, which trustees are empowered to hold as a recognized investment; and it may bear a varying rate of interest. The importance of this proviso will be readily seen. For instance, whether the undertakings continue under private management or are transferred to a public authority, further capital will be required as new mains are laid to meet increased demands. Possibly in the course of the next generation, a large sum will have to be raised to open up new sources of supply; and the value of the undertakings as now existing will then be little more than the value of the mains and pipes for the purposes of distribution. It may be assumed, therefore, that the value of the water undertakings, on their present basis, will diminish as time goes on; and, for this reason, it is not unfair that the present shareholders should receive the full advantage of their holdings in the Companies while the interest at definite periods is automatically reduced, in the same way as the interest on Government securities will diminish under the Act for the conversion

of the National Debt. As an illustration of one manner in which this provision will work, the following figures are given :—

Amount of purchase stock	£33,500,000
Initial rate of interest, 3½ per cent. Annual charge	£1,172,500
In (say) 20 years, further capital is required, and comes into charge.	
In 20 years, the rate of interest is reduced to 3 per cent., and the annual charge on the original purchase stock is	£1,005,000
In (say) 40 years, a new source of supply must be adopted.	
In 40 years, the rate of interest is reduced to 2½ per cent., and the annual charge on the original purchase stock stands at	£837,500

The principle of a varying rate of interest is adopted in preference to power of redemption at intermediate periods, which, so far as can be foreseen, would probably yield at least as favourable results to the Water Trust, because an ascertained (though diminishing) rate of interest for the whole period of the stock would tend to maintain its market value at a more equable price, and thus be advantageous to *bonâ fide* investors.

Current Expenses, Interest on Debt, &c.—It is anticipated that these will be met by the revenue derivable from water-rental; but provision is made for raising any deficiency by precept upon the local rating authorities. The provisions of the Elementary Education Act, 1870, are followed in cases where the rating authority make default in paying the precept. Water-rentals are to be collected by the local rating authorities in the same manner as the poor-rate, and subject to the like audit. Surplus income of the Trust is to be applied to the equalization of water-rents throughout the area of supply; the improvement of the existing system of supply; and the reduction of water-rents.

Audit.—The accounts are to be kept in the form prescribed by the Local Government Board, and audited by an Auditor appointed by that Board.

Officers and Servants.—Officers and servants in the service of the Companies are to be taken over by the Water Trust, or compensated; and the Trust are to have full power to appoint officers.

Consultative Members.—To facilitate the transfer, power is taken to appoint not more than three consultative members for the first three years after the passing of the Act. These members are to be selected from the Chairmen, Directors, or principal officers of the Companies, and are not to have power to vote.

Miscellaneous.—The Trust are to provide offices; may make bye-laws; are to discharge the debts and obligations of the Companies; are to continue or to suffer actions commenced by or against the Companies; and are to sell at their discretion superfluous lands. The books and accounts of the Trust are to be open to inspection.

Power to County Council to carry the Act into Execution.—This part of the Bill is practically an alternative proposal to the creation of a special Trust, as provided in the earlier part of the Bill. Clause 54 specifies that if at any time between Nov. 1 and Dec. 31, 1891, the London County Council shall, by a majority of the votes of the entire Council at a special meeting convened for the purpose, so resolve, the Council shall become the Trustees for carrying out the Act, and the Act is to be read as if the Council were substituted throughout for the Trust. Subsequent clauses provide for the necessary alterations being made in the Act.

The Committee conclude by expressing the belief that, though the Bill of which the foregoing are the principal features may be open to objection in points of detail, they may fairly claim to have prepared a comprehensive scheme, complete in itself, founded on principles which Parliament has already recognized in similar cases, and adapted by special provisions to the magnitude of the case.

In an appendix, the Committee give, in parallel columns, a summary of the operative clauses of the Bill promoted by the Corporation of London, the principal parts of which were reproduced in the JOURNAL for Dec. 30 last, and the corresponding provisions in their own Bill. These may be shortly indicated here. Clause 2 of the City Bill incorporates the Commission; this is done by clause 3 of the Committee's Bill. Clause 3 of the City Bill confers power on the Commission to promote Bills for a number of purposes therein set forth. Clause 11 of the Committee's Bill gives the Water Trust power to apply to Parliament for any purposes connected with the water supply of the Metropolitan water area, or the extension or improvement thereof. The Commission is to consist of 51 members—2 *ex officio*, and 49 nominated by various public officials and bodies. The Trust is to be composed of 39 members, all elective, representative of various interests in the Metropolitan water area. Members of the Commission are to be nominated within six months after the passing of the Act; the first election for the Trust is to be held in February, 1892. Each of the 49 nominated members of the Commission is to be paid for his services; in the Trust, the only paid members will be the Chairman and Vice-Chairman. Other provisions of the City Bill are to be found in clauses of the Bill of the Committee.

A conference of members of Parliament and Vestry delegates took place at the St. James's Vestry Hall, Piccadilly, on Monday last week, when a resolution was passed approving the introduction of the Bill, and asking the Government to afford facilities for its being proceeded with. It was decided to request the President of the Local Government Board to receive a deputation on the subject.

Gasholders Without Guide-Framing.—The continued increase in the demand for gas at St. Mary Cray has caused the Directors of the Gas Company in that town to consider the advisability of providing increased storeage at their works; and it has been decided to erect a new gasholder this year. Their Manager (Mr. F. M. Edwards), after inspecting the holder at the Northwich Gas-Works—which was erected on the Gadd and Mason principle, and has worked with perfect success since its completion—gave a favourable report of the structure; and the Company have therefore decided to adopt this principle. The contract for the manufacture and erection of the holder has been placed with Messrs. R. and J. Dempster, of Manchester, who, we are pleased to learn, have three more holders on this plan now in course of manufacture at their works.

THE PROPOSED PURCHASE OF THE NORWICH WATER-WORKS BY THE CORPORATION.

The Financial Position of the Company.

In last Tuesday's JOURNAL, it was intimated that the Norwich Town Council had instructed a Special Committee to take steps to ascertain the proper value of the Water Company's undertaking, with a view to making an offer for it. This instruction was given to the Committee at the meeting of the Council on the previous Tuesday, on which occasion they presented a report, which gave details of the capital, receipts, and payments of the Company. From this it appears that the capital on Sept. 29 last was £266,748. The market value of the share debenture stock and capital was £317,489. The receipts for the year ending Sept. 29 were £20,360; and the payments were as follows: Working and establishment expenses, £8547; dividends and interest, £11,423; balance of receipts over expenditure, £389—total, £20,360. The ordinary shareholders were entitled to a dividend not exceeding 6 per cent. per annum on the share capital. The Directors stated, however, that the dividend actually paid had fallen short of what the shareholders were entitled to receive by about £34,000. In the event of compulsory purchase of the works, this sum, the Committee said, would probably be an item in the claim for compensation; but as no portion of it had been set aside, and the present holders of the shares were not the same persons as were shareholders when a larger dividend might have been paid if the funds of the Company had permitted, it was hardly probable that a claim to such a sum could be substantiated for division among the present shareholders. The Manager of the Company had made a written report to the Directors, in which it was stated: (1) At the time the Company obtained their original Act, it was the rule of Parliament to allow 10 per cent. per annum on all ordinary share capital; but a maximum of 6 per cent. was accepted by the Company, and their policy throughout had been to make the undertaking a good substantial property. (2) 17,000 houses were supplied with water, 2831 of which only paid 1d. per week for domestic purposes; and 11,000, including houses having water-closets, averaged less than 1½d. per week. (3) The Corporation were supplied with water for street and sanitary purposes at less than cost price. (4) The Company had never allotted any shares to the proprietors since they were at a premium. All shares had been sold by public auction; and the premiums realized had been carried to capital account without bearing interest. By this means the citizens had been paying from 3½ to 4 per cent. only upon money raised as share capital. The Directors intimated that they were certainly not desirous of parting with their property, and that they would be unwilling vendors. They declined to enter on any discussion as to terms of sale; but the Chairman said that if an offer to purchase were made by the Corporation a meeting of the Company would be called, when the terms would be considered. As already mentioned, it was thought by the members of the Council that the particulars contained in the report warranted them in instructing the Committee to pursue their inquiries, and ascertain the value of the undertaking.

WORCESTER CORPORATION WATER SUPPLY.

The Present Works to be Improved.

The water supply of the city formed the principal topic of discussion at the last meeting of the Worcester Corporation. In the report of the City Analyst (Dr. Swete), it was stated that a sample of water submitted to him on Dec. 25 last was the worst specimen of town water he had met with, and it showed that the water had not been efficiently filtered. In the course of a short but sharp discussion on the report, the Chairman of the Water and Sewerage Committee (Mr. Corbett) denied that the condition of the water was attributable to any deficiency in the filtration, but was entirely owing to the state of the river. After other business had been transacted, Mr. Corbett moved a resolution authorizing his Committee to sink a trial bore-hole for water at Burcot at a cost of £1200. He made a lengthy speech in support of his motion. A statement, he said, had been circulated that the East Worcestershire Water-Works Company had a monopoly of the Lickey district; but he was advised by the Town Clerk that the monopoly only extended to the supply of water, and that they had not an exclusive right to the water which might be found in that area. If the Corporation constructed works at Burcot, they would not be at liberty to retail water in Bromsgrove, Redditch, or the Lickey district. Mr. Corbett went into the history of the water question; pointing out that attention was called to the unsatisfactory state of the town water as far back as 1883. Reports by experts showed that the water from the river varied considerably in quality; but as to the quality of the Burcot water, Mr. Etheridge in 1884 said the purity of the water of the Bromsgrove district could not be suspected. If the present system was to be maintained, it would be absolutely necessary that there should be additional filter-bed accommodation; and they would have to spend at least the amount that it was calculated they could bring a supply from Burcot for—viz., from £26,000 to £27,000. The motion having been seconded by Mr. Wilesmith, an amendment was proposed by Mr. Williamson—"That the Water and Sewerage Committee be requested to at once proceed to improve the city water-works, by constructing: (1) A new filter in the present grounds, which the Surveyor has reported 'will be of great service, especially in times of flood,' at an estimated cost of £880; and (2) a large subsiding tank in the present grounds, which the Surveyor has reported to be 'very desirable,' at an estimated cost of £2050." In his remarks, Mr. Williamson stated that the East Worcestershire Water Works Company were willing to sell their works for £63,000; and he could not imagine that the expenses of the Worcester supply would be less than that of the Company. They would have to encounter serious opposition in the House of Commons to get the Act permitting the works to be carried out at Burcot, and they would have to pay something for the right of laying the mains where it was necessary to pass on to private land. They would have to construct a large reservoir; and the expense of doing this and other necessary things would bring

the total cost of the scheme up to £100,000. Mr. de Rance would not give them a guarantee that the source of supply which they wanted to tap would be enough for Bromsgrove, Redditch, and other places, as well as Worcester. The utmost estimate of the supply from Burcot was 2 million gallons a day; and he asked if this was a sufficient and reliable quantity for the city to go to under the circumstances. The amendment was seconded by Mr. Caldicott, in whose opinion the cost of the Bromsgrove scheme would not fall far short of £50,000. If the money was borrowed for 30 years at 3½ per cent., the maintenance of the two water-works, and the repayment of loan and interest, would, he contended, make a total annual cost to the city for thirty years of £6534. Alderman Hill admitted that the state of things in Worcester imperatively demanded some alteration in the water supply; and he expressed a preference for properly purified water from the river, to a supply from a source that was uncertain in quantity. Mr. Matthews did not think there was sufficient water at Burcot, and said he hoped the Council would retain the Severn water, which was the natural supply of the city, and had been so for the last 100 years. Alderman Airey supported the motion; remarking that not a dozen members of the Council present would say that the Severn water was fit for domestic use; the water was bad, and was condemned all round. Further discussion of a similar character followed; and then Mr. Corbett replied on the debate. He pointed out that at present there was no conclusive evidence as to the quantity of water available at Burcot—that being the very object of his motion; and he maintained that the new supply would be cheaper than that of the Severn. On a division being taken, the amendment was carried by 19 votes to 16.

Abolition of Gas-Meter Rents at Malton.—At a meeting of the Directors of the Malton Gas Company last Tuesday, they decided to cease charging rental for meters. This will cost the Company about £200 per annum. The price of gas now stands at 3s. per 1000 cubic feet.

Sale of Shares.—A number of shares in the Hartlepool Gas and Water Company were recently sold by auction at Durham, at the following prices: 38 "A" shares realized £9 15s. to £10 each; 2 "B" shares, £9 2s. 6d. each; 38 "C" shares, £8 2s. 6d. to £9 each; and 9 "D" shares, £16 7s. 6d. to £16 19s.

New Joint-Stock Companies.—The following joint-stock companies have just been registered: The Combined Process Gas Syndicate, Limited, with a capital of £2000, in £1 shares, to carry on business as gas, coke, and chemical manufacturers; and the Wanzer and Defries Patent Safety Lamp Manufacturing Company, Limited, with a capital of £25,000, in £5 shares, to acquire the business carried on under the style of "Wanzer, Limited."

The Storeage Accommodation at the Manchester Gas-Works.—Mr. Henry Simon, M. Inst. C.E., of Manchester, writes as follows to a local contemporary: "I am the owner of two gas-engines, one to drive the electric light at my offices. When I made this expensive private installation, I was looking forward to having an equable and steady supply of electric light; but what was my disappointment to find that, just when the electric light was wanted most—*i.e.*, on dark and foggy Manchester days—the pressure in the gas-mains was so reduced that my gas-engine could scarcely be started, and was unable to produce the proper amount of power. The consequence was that during the foggy weather my offices were in comparative darkness. It seems to me that the city authorities, who draw such large revenues from the manufacture of gas, should spend the necessary amount on gas storeage, so as to adapt their manufacture to the exigencies of the Manchester climate. They should not be forced to reduce the pressure as soon as the sky gets darkened. In the long run the present way of treating the owners of gas-engines and gas-stoves can only result in discouraging the introduction of these otherwise very desirable improvements."

The Exeter Gas Company Threatened with Competition.—At last Wednesday's meeting of the Exeter Town Council, a curious letter from a Mr. E. J. Rigby was read. The writer stated that it was the intention of those acting with his Company to apply to Parliament in the autumn of the present year for lighting powers; and although they anticipated strong opposition on the part of the Exeter Gas Company, which they were quite prepared to encounter, they were not disposed to incur the necessary expenditure to successfully fight this opposition, unless they had the support of the Council. He was also requested to point out that the average illuminating power of gas throughout the United Kingdom was 22¼ candles! whilst in Exeter it was only a little over 14 candles. Exeter was one of the worse lighted cities in England, notwithstanding the large sum it annually spent. His Company could supply 100 per cent. more light at the same cost. In conclusion, it was asked that a communication of the 13th ult. should receive that consideration which its importance to the citizens entitled it. The members of the Council were greatly amused by the statements in the letter; and it was ordered to "lie upon the table."

Opposition to the Stourbridge Gas Company's Bill.—A public meeting was held at Stourbridge yesterday week to enable the ratepayers to give their consent to the proposed opposition of the Improvement Commissioners to the Gas Company's Bill. Mr. H. Collis, who presided, explained the main provisions of the Bill. By section 7, the Company proposed to form an insurance fund equal to one-twentieth of their paid-up capital to meet any extraordinary claim upon them due to accident, strikes, or other circumstances. They asked for power to set aside in any one year for this fund a sum limited to 1 per cent. on the paid-up capital after they had paid themselves full dividends. He thought the fund should be formed out of the dividends of the shareholders, instead of in the way proposed. Under section 8, after paying full dividends and setting aside a percentage for an insurance fund, it was proposed to carry forward the balance of the clear profits of the undertaking to the credit of the divisible profits of the following year. This was also in favour of the Company; and no advantage to the consumers. Section 10 put the standard price of gas at 3s. 3d. per 1000 cubic feet. The present price was 3s. 2d.. So that, under this section, the shareholders would get 10¼ per cent. instead of 10 per cent., which was their maximum limit now. He thought the Company and consumers ought to start level. A resolution consenting to the Commissioners' opposition was agreed to.

NOTES FROM SCOTLAND.

From our Edinburgh Correspondent.

EDINBURGH, *Saturday*.

The railway strike in Scotland went finally out of existence to-day. On Thursday the North British Company's men came to terms with the General Manager; and on Saturday the Caledonian Company's men followed suit. The settlement is a virtual collapse on the part of the men, who obtain no better terms than they were offered when the struggle commenced. They simply return to work—as many as can be taken on—and the Managers are to arrange meetings between them and the Directors, for the redress of grievances. While on the high horse, their demands were that all should be reinstated to their former places, or that none should return to work. It is probably only a fair example of the peculiar form of selfishness which lies at the foundation of trades unionism, that when the North British men resolved to give in, they did so without regard to the fate of the Caledonian men, who were consequently left out in the cold. The significant feature of the strike is the stubborn resistance of the Railway Managers to the demand of the men that their organization should be recognized, and the fact that they have been able to get their men back again without having to accept the Union. It is matter for congratulation that the New Unionism has been, if not killed, at least effectually "scotched" by the Railway Companies. So far as the supplying of gas-works with coal was concerned, there has been no difficulty on that score during the past week; and this was one of the circumstances which clearly pointed to a collapse of the strike. Although the men have gone back beaten, everyone will join in the hope that they may benefit in the reduction of their hours of labour by their great sacrifice. The Managers will easily concede something on that point now that they have been able to shake the Unionist vampire from their throat, and have not to fear the after-demands which would have followed had they given in.

There was, as I expected, a rather lively meeting of the Edinburgh and Leith Gas Commission on Monday. First of all, there came up the question of the checking of gas-meters, upon which Mr. Macnaughton had resigned. The subject was originally taken up at the instance of Mr. Macnaughton; and the Works Committee, after considering it, found that the only thing they could recommend was to print in red ink on the receipt slips an intimation that the surveyor would, if requested, leave a slip stating the reading of the meter and the consumption, or, if desired by any consumer, a pass book would be sent from the office, in which the surveyor would make the entries. To have gone further would have been to confess that the practice has hitherto been erroneous. Yet Mr. Macnaughton, albeit he has proposed no better method of checking meters, was not satisfied; and he has severed his connection with the Commission. Several members of the Commission attempted to support Mr. Macnaughton's conduct; but the Lord Provost pointed out, in effect, that they put forward nothing which would justify them in declining to discharge the subjected as the Works Committee had recommended, and it was accordingly discharged. It is open, however, to anyone to bring it up again. Then the question came up which I mentioned last week, of the interference of one of the Commissioners with Mr. Mitchell in the discharge of his duties during the railway strike. Mr. D. M. Jamieson said that he was the Commissioner referred to; and he stated that he was waited upon by four engine-drivers who explained their grievance, and, as they put it themselves, they wished as ratepayers to state the grievances personally. He told them there would be no meeting of the Commission for some days, but he would ask if Mr. Mitchell would receive a deputation. He complained that it had been represented that he wished to leave the city in darkness, which was not his intention. The explanation was not considered very satisfactory; and Mr. Jamieson was quietly but effectually rebuked by the Lord Provost for his conduct, as well as by Mr. Fisher, who said that if it was not his intention to leave the city in darkness, it was very near it, and was a most injudicious action. After that the Engineers' reports as to how the strike had affected their working were submitted. Mr. Mitchell reported that on Jan. 9 he had only 1020 tons of coal in hand, and that on the 12th he had only 300 tons, which, considering that over 400 tons are required daily, was less than one day's supply. On the same date Mr. Linton reported that at Leith he had five days' supply. On the 19th both Engineers reported that the supply of coal was improving; and from that time onward it continued to do so. There was, after that, a short grumble by Bailie Archibald at the heavy charge—about £400—for skilled witnesses in the action by Messrs. Mackay and Co. against the Commissioners; but it was directed chiefly against Mr. Macnaughton, who was Convener of the Law Committee. Bailie Archibald seems to have a particular pleasure in taking Mr. Macnaughton to task; and while I do not say it is undeserved, he will know when to stop, granting that Mr. Macnaughton is re-elected by the Town Council, so as not to allow the business of the Commission to degenerate into personal questions. Finally the Engineers' reports for the month of December were submitted, which showed that the output of gas from the Edinburgh works was 143,027,000 cubic feet, an increase of 18,542,000 cubic feet upon the output in December, 1889; and that from the Leith works the output was 63,947,000 cubic feet, or an increase of 1,139,000 cubic feet. The illuminating power was: In Edinburgh 26·34 candles, and in Leith 26·57 candles; as compared with 29·16 and 27·93 candles respectively in the corresponding month of the previous year.

The Works Committee of the Dundee Gas Commission have resolved to recommend the erection of a new bench of 90 retorts, at a cost of £1800, to enable them to cope with the increased consumption of gas, and to provide a reserve of retort power in case of a breakdown.

From our Glasgow Correspondent.

GLASGOW, *Saturday*.

Not much that is really new has transpired regarding the disaster to the Dawsholm gasholders since my last communication on the subject. The report to the Glasgow Corporation Gas Committee by the experts—Sir William Arrol and Messrs. Livesey, Hunt, and

Gillespie—was considered at a special meeting of that body held on Monday afternoon, and subsequently published in the late editions of the evening newspapers; but the facts and conclusions embodied in it had been mostly discounted by my communication of the previous day, which was given in the last issue of the JOURNAL. The report has since been published all over the kingdom, and therefore I need not deal with it in any detail; indeed, it was an exceedingly short official "deliverance" on the subject, as if the experts did not deem it necessary or politic to say much about it. They seem to have committed themselves to the notion that some explosive material was used on the crown of No. 2 holder, and that the force of the explosion of that substance penetrated inwards and ignited the gas that was contained within the holder. Mr. Lundholm, of Nobel's Explosives Works, Ayrshire, seems to have entertained the same idea; and acting on his suggestion, the Gas Committee authorized the transmission of a request to the Home Secretary to institute an inquiry under the provisions of the Explosives Acts, on behalf of the Government. Accordingly, Colonel Ford, R.E., one of the inspectors under the Act, forthwith made his appearance at the Dawsholm Gas-Works; and this day week Dr. Dupré, F.R.S., was also upon the ground. That gentleman, who is a highly-skilled authority on the chemistry of dynamite and other explosives, is attached to the Home Office as an expert in the department of the administration of the Explosives Acts. I am told that his visit to the works was of short duration; and that he took away with him a piece of the sheeting of No. 1 holder crown, on which there were certain marks which seemed to indicate an act of foul play from the outside. Whether or not he has since discovered any chemical traces of nitro-glycerine or other nitrogenous explosive compound, I have not learned. Colonel Ford has not been in such a hurry to make his report as the four experts who were employed on behalf of the Corporation Gas Committee were with theirs. The hurry of publication, however, was perhaps not so much due to the experts as to the Gas Committee, who may have thought that they were in duty bound to let the community generally know as soon as possible what opinion Sir William Arrol and his co-experts had arrived at. Colonel Ford has, I believe, been going about Maryhill and the adjacent suburbs taking evidence in private from such persons as were known to have something to say regarding what took place at, or in connection with the two holders on the afternoon of Thursday, the 15th of January. He was certainly in Glasgow to-day (Saturday); but he may have now concluded his private official inquiry, the report on which is not likely, I am told, to be made public. As to the policy of "keeping his report dark," I shall not express any opinion; but I should certainly like to see it and study the alleged facts and the conclusions it may contain. A reward of £1000 has been offered to any person or persons able to give such information as will secure the apprehension and conviction of the person or persons by whom the explosive substance is assumed to have been applied to No. 2 holder. The Dumbartonshire police authorities have, I understand, been communicated with as to the mode or terms in which the reward of £1000 is to be offered. It is not unlikely that the work of repairing both of the holders will very shortly be entered upon; indeed, I have been informed that No. 1 holder is to be taken in hand by the Barrowfield Iron-Works Company, who will furnish the labour and necessary materials at fixed rates. It is highly desirable that at least one of the holders should be put in order again with the least possible loss of time; and before No. 3 can be supplied with a third lift, it is in a sense absolutely necessary that No. 2 holder should be in a thoroughly satisfactory working condition. Mr. Foulis has assured the Gas Committee that, in his opinion, the work of repairing both holders can be executed by an expenditure of about £5000, as I mentioned a week ago.

Within the last few weeks, retort-drawing machines have been brought into very successful use in Glasgow. The original machine was designed by Mr. Foulis, and subsequently several new machines were ordered from Sir William Arrol and Co.; and quite lately an order for other eight machines, which are to be set to use at the Dalmarnock and Tradeston works, has been given to that eminent firm. I shall have something further to say about these machines by and by.

The half-yearly general meeting of the shareholders of the Coatbridge Gas Company was held last Tuesday—Mr. David Bird, Chairman of the Company, presiding. In the report submitted for the six months ending on Dec. 31, 1890, it was stated that the total income for the half year was £6725 14s. 10d., and that the profits amounted to £1762 9s., which, with the balance of £1680 16s. 1d. brought from the preceding half year, made a sum of £3443 5s. applicable to dividends. It was also stated that the unaccounted-for gas was at the rate of 13 per cent.; and that the average illuminating power over the half year was 26·64 standard candles. The amount of gas sold by meter was 31,646,800 cubic feet, at 3s. 4d. per 1000 cubic feet; and the sum of £275 13s. 2d. was received for public lighting. (The price now is 3s. 9d. per 1000 cubic feet, owing to the increased price of coal.) Meter-rents realized £220 19s. 9d.; and the sales of sulphate of ammonia and residuals, &c., brought in a sum of £855 8s. 1d. For gas coal and shale used there was an expenditure of £1919 1s. 11d.; dross and house coal cost £100 1s. 5d.; and the cost of lime and oxide of iron used amounted to £106 18s. 10d. For repairs of works, mains, meters, &c., there was expended £1096 8s. The salaries of the Manager and Secretary, and other officers required £340; and the wages account amounted to £787 11s. 3d.; while the fees for Directors and Auditors amounted to £79 13s. The original stock of the Company is set down at £1265, and the new stock at £32,000, or £44,650 in all. There are loans to the extent of £2000; the suspense fund shows £3000; and the profit and loss account amounts to £3443 5s. 5d. These and other items bring up the liabilities to £55,418 9s. 5d. In the assets the value of the works, mains, meters, &c., is given at £45,329 4s. 2d., the sulphate works and plant stand at £556 11s. 7d., the tar works at £229 4s. 9d., house property at £3049 4s. 6d., and office furniture at £99 1s. 11d.; while the amount due by consumers when the balance was made was £4031 12s. 1d. The stocks of coal, shale, dross, lime, oxide of iron, gas, sulphate, &c., and general stores stood at £1621 7s. 10d.; and these and other items, together with cash in bank, brought up the assets to £55,418 9s. 5d.—the same as the liabilities. After the report was submitted to the meeting on Tuesday, it was resolved, on the motion of the Chairman, to declare maximum dividends of 10 and 7 per cent. on the new and old stocks, respectively. Messrs. Bird, Murray and Wilson, the retiring Directors, were re-elected.

On Thursday evening the Lighting Committee of the Falkirk Town Council again had under consideration the quality of the gas supplied by the local Gas Company, as also the terms on which a supply for the public lamps is given. In view of what was regarded as the unsatisfactory state of the supply, the meeting discussed the propriety of presenting a Bill in the next session of Parliament with the object of securing power to the town to take over the gas-supply undertaking in its entirety; but no resolution was come to on the subject. It may be asked of the Falkirk Town Councillors who constitute the Lighting Committee, and of Mr. Wilson, the Town Clerk, if they are not aware of an Act being already in force in Scotland for enabling burgh authorities to acquire gas-supply undertakings on a much less expensive plan than by themselves going to Parliament for a Private Act? They ought to be well aware of the existence of the Act—the more especially as the Burgh of Denny, which is only a short distance from Falkirk, adopted it within the last few years.

The stock of the Partick, Hillhead, and Maryhill Gas Company has been dealt in this week at 90s. per share.

The Scotch pig iron market fluctuated during the past week between 47s. 5½d. on Monday and 46s. 3d. per ton on Thursday; while the closing price yesterday afternoon was 46s. 4d. per ton cash buyers. The flatness is said to have been due to rumours as to the likelihood of some of the blast furnaces being blown in very shortly, of which, indeed, there seems to be some probability, as the makers of "special brands" have been quite denuded of stocks.

There has been a more favourable condition in the local coal trade this week; and supplies all round have been much larger. Famine prices are no longer exacted by the coalmasters and middlemen.

Last week the lowest price accepted locally for sulphate of ammonia was £11 8s. 9d. per ton; but subsequently £11 10s. was paid. For forward delivery, business was quieter; but prices were maintained. This week local producers have been more easily dealt with as to prices.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Jan.* 31.

Sulphate of Ammonia.—The firmer tone of the market, indicated in last week's report, is well sustained; and a further advance has to be recorded. Continental consumers are all more or less buyers now; and a fair business has been done, although many refuse to pay the enhanced values—still clinging to the hope of lower prices again in the near future. From the present aspect of the market, they are likely to be disappointed, for there are eager buyers for February delivery at £10 17s. 6d. Hull and Leith, and an advance could be obtained for March parcels. Besides any existing stocks have been well cleared; and it remains to be seen whether the decreasing production during February can keep pace with the expected large demand. There is not much change in the nitrate market; the news of a final arrangement among producers having affected the market very little so far. The spot price is 7s. 10½d. to 8s. per cwt.

LONDON, *Jan.* 31.

Tar Products.—The week has been a busy one. Large shipments of pitch and other accumulated products have taken place, with the opening of foreign ports. Prices are fairly firm all round; benzol particularly so. There are buyers now for July-December at a price very nearly approaching to-day's quotation; a good sign for the permanency of the price, which during the past twelve months has so gradually been raised nearly 1s. per gallon. The aniline oil and salt trade is remarkably good; and so long as the present demand continues, benzol will not be cheaper. Common oils are somewhat flat; and the same remark applies to anthracene and carbolic acid. To-day's prices are about: Tar, 29s. to 32s. Pitch, London, 35s. 6d.; country, 33s. 6d. Benzol, 90 per cent., 4s. 8½d.; 50 per cent., 3s. 6½d.; for forward delivery 2d. less in each case. Toluol, 2s. Solvent naphtha, 1s. 9d. Crude naphtha, 1s. 8d. Creosote, 2¼d. Heavy oil, 2¼d. Crude carbolic, 60's, 1s. 6d. Cresol, 9d. Anthracene, "A" quality (30 per cent.), 1s. 3½d.; "B" quality, 1s.

Sulphate of Ammonia.—A steady improvement has manifested itself in this market during the week. Home buyers are now purchasing freely; and as makers are not pressing their stocks on the market, together with the freer shipments and the improved weather, this is no doubt the cause of the higher prices obtaining. Business has been done at £10 12s. 6d. to £10 15s. for spot, and £10 15s. to £11 for forward delivery. Ammoniacal liquor is selling more freely at 5s. 6d. to 7s. 6d. according to strength.

The Electric Light in Durham Cathedral.—During last week, experiments were made with the electric light in Durham Cathedral; and on Friday night the nave and transepts were illuminated with the light. According to a Newcastle paper, the effect was very pleasing; and it is probable that the building will eventually be lighted with electricity.

The Oil Lighting Experiment at Erith.—An Erith Correspondent writes: "Disgusted with the oil lighting experiment, the Erith Local Board have appointed a Committee to report upon the whole question of lighting the district, and upon the desirability of returning to gas at the expiration of the contract with the Defries Company, which terminates on the 21st of July next. Figures are formidable; and in this connection they have persistently pointed to the inadequacy of oil lighting as carried out at Erith. To take last quarter's account, the contract amounted to £170; but from this sum the Local Board will deduct £142 15s. as fines in respect of the lamps which were found unlighted. This means that, independently of lamps which had gone wrong, and the nauseating drippings of oil, which occasioned much discomfort, the public during the worst quarter of the year have lost the lighting power on an average of 12½ lamps per night. As many as 1142 lamps being found "resting" in one quarter should cause the Board to be very careful as to their action, and should make them chary of innovations, especially those with a retrograde tendency."

Wirksworth Water Supply.—Mr. W. H. Radford, of Nottingham, has prepared a scheme for obtaining an increased supply of water at Wirksworth. The town is now served by gravitation from springs issuing from the millstone grit. There is a large surplus of water during the winter; but the springs run very low, and there is consequently a scarcity for about three months in the summer. As there is no additional supply available within a reasonable distance, it is proposed to construct an open stone-built reservoir to hold 3 million gallons, so that the winter's surplus may be stored for use in summer.

The Sheffield Water Supply and Lead-Poisoning.—Despite the fact that the Redmires water is generally more active to take up lead in the winter months, it is satisfactory (remarks a Sheffield contemporary) to be able to say that not a single case of lead-poisoning, traceable to the use of the water, is known to exist in Sheffield or the neighbourhood. The chalk treatment of the water as it enters the culvert at Redmires, seems to have effectually taken away its power to absorb lead. This treatment was begun at the end of March; and since then lead-poisoning has, it is believed, entirely disappeared. Doubtless the Redmires water, as it leaves the reservoirs, has as strong an affinity for lead as ever; but this is destroyed by the chalk long before the water enters the mains. Analyses of the water, after it has passed through the service-pipes, are being frequently made by the Engineer (Mr. E. M. Eaton), with the satisfactory result that no trace of its action on the lead can be discovered.

The Action of Water on Lead.—At a recent meeting of the Physical Section of the Dundee Naturalists' Society, Mr. W. Kew, F.C.S., read a paper on "The Action of Dundee Water on Lead." The author showed that the action of Dundee water on a new leaden pipe (at atmospheric pressure) is at first very considerable, but that it rapidly decreases until it reaches a very small minimum. By the addition of small quantities of carbonate of soda to the water, the large primary action referred to is prevented, while the minimum action is considerably reduced. By increasing the pressure on the water to 45 lbs. per square inch, it was found that it had no action whatever on lead. On filtering the water slowly through very finely divided flint, it was found to have taken up a small quantity of silica, and that the action of the filtered water on lead (at atmospheric pressure) was less than in the case of the unfiltered water. The necessity of always submitting a suspected water to the pressure test, as well as examining its corrosive power under ordinary circumstances, was pointed out.

The Recent Defective Public Lighting at Gravesend.—Mr. Frank Wright, of London, who was appointed by the Gravesend Town Council a few weeks ago to test the quality of the gas at Gravesend, and report upon the cause of the recent inability of the Gas Company to light some of the street lamps, has presented the result of his investigations. As regards the stoppage, he is of opinion that it did not occur as the natural consequence and effect of the continued frost, but was entirely due to the abnormal percentage of "aqueous vapour" present in the gas. Without the proper information to guide him, he could only surmise that the Company's plant was in some particular slightly inadequate for the manufacture of the maximum quantity of gas at this period of the year; and that the gas was probably sent into the mains at a rather higher temperature than the state of the atmosphere warranted, due to the heating of the water in the gasholder tanks and lutes, to prevent them from freezing. Mr. Wright reports that the three samples of gas taken by him at the Town Hall gave, on testing, an illuminating quality of 16·04 candles.

London Water Bills.—Last Friday, the London Water (Meter) Bill and the Metropolitan Water Companies' Charges Bill, although introduced as Public Bills, came before Mr. Campion, one of the Examiners of Petitions for Private Bills, by order of the House of Commons, for proof of compliance with Standing Orders. The former Bill was opposed on a memorial by Mr. James Searle, Secretary of the New River Company, alleging that the Standing Order which requires that the parliamentary notice shall correspond with the short title of the Bill had not been complied with, inasmuch as in the former the word "Metropolitan" was used, and in the latter the word "London." Mr. Frere (Messrs. Rees and Frere) supported the objection; Mr. Cameron (of Messrs. Sherwood and Co.) opposed it. After some argument, Mr. Campion said it was unfortunate that the short title of the Bill should have been changed; but the practical question he had to deal with was, whether the Water Companies had been prejudiced by the alteration which had been made. Considering that they had due notice of what was contemplated, he did not think any harm had been done by altering the title; and therefore he should not allow the objection. The Bill accordingly passed the initial stage; as did also the companion measure, which was not opposed.

Barnsley Corporation Water Supply.—At the next meeting of the Barnsley Town Council, a question of great importance, not only to Barnsley but to several of the populous villages round about, will come up for consideration. The Water Committee of the Town Council recommended last August that notice should be given that the present arrangement, whereby the local authorities of Worsborough, Ardsley, Darton, Monk Bretton, and Cudworth are supplied with water from Barnsley, at a shilling per 1000 gallons, might probably not be continued after Jan. 1, 1892. The Committee now report that, after having given further consideration to this question (the importance of which to the borough, from a financial point of view, they fully recognize), they applied to the Penistone Local Board with a view to acquiring their water-works. The Board, however, declined to sell the works, and gave notice to the Council to terminate the existing agreement for the supply of water, which has not been acted upon, because not needed. Any hope of a subsidiary supply from this source having to be abandoned, the Committee have considered the scheme of extending the present works, as formulated by Mr. Hawksley in 1875. It would give an additional supply of 750,000 gallons per day, in addition to the present supply of 1,250,000 gallons; but they believe the cost would be such that they could not continue to sell water to the out-townships named at any such price as those townships would be willing to pay. They find that for the borough and the townships included in the Acts of Parliament, the present supply will be adequate for many years to come; and therefore cannot recommend the Council to apply for powers to extend it.

Electric Lighting for Preston.—Last Thursday, the Preston Town Council gave their consent to the application of the National Electric Supply Company for a Provisional Order, empowering them to light the principal thoroughfares of the borough with electricity.

Overhead Wires and Snowstorms.—As the result of a fearful snowstorm which visited New York on the night of the 24th ult., all the electric light and other wires were displaced, to the great inconvenience of those who depended on these means of illumination and communication. In the lower part of the city, where the old-fashioned telegraph posts were still standing, the streets were blocked with numbers of prostrate poles and miles of entangled wires. On the following nights not a single electric light was visible.

The Alliance and Dublin Consumers' Gas Company and the Corporation.—A writ at the suit of the Alliance and Dublin Consumers' Gas Company has been served on the Corporation for the recovery of £4048 in respect of certain disputed quarterly accounts for the public lighting of the city up to April 5, 1890. An appearance will be entered on the part of the Corporation. On the *agenda* for yesterday's meeting of the Town Council was a recommendation of the Special Gas Committee, that the Corporation should purchase the city gas-lamps, now the property of the Company, for the sum of £14,341 1s. 1d. This figure, it will be remembered, was recently fixed by arbitration.

Northern Coal Trade.—The coal trade is now fairly steady, though some of the causes of recent activity are passing away. Northumbrian steam coal is steady on the basis of from 11s. 6d. to 11s. 9d. for best qualities, 10s. 9d. to 11s. for seconds, and 4s. 3d. to 4s. 6d. for small steam, all free on board. There is still a large demand for gas coals; and the limitation of the output by the shorter hours worked is keeping in a few instances the contracts a little behindhand, and will thus render the period of activity at the pits longer than usual. The price varies very much; and possibly from 10s. to 11s. per ton free on board may be about the best quotation this week. In coke, the lessened demand for the West Cumberland district has rather made the market quieter for blast-furnace kinds, the price of which is still £1 per ton, free on board. There is no alteration in the demand for gas coke, and the price is unchanged.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 198.)

Issue.	Share	When ex-Dividend.	Dividend on Ord. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	10 Oct.	10½	Alliance & Dublin 10 p. c.	10	16—17	..	6 3 6
100,000	10	,,	7½	Do. 7 p. c.	10	12—13	..	5 15 6
300,000	100	2 Jan.	5	Australian (Sydney) 5 % Deb.	100	105—107	..	4 13 5
100,000	20	27 Nov.	8	Bahia, Limited	20	16—18	..	8 17 10
200,000	5	13 Nov.	7½	Bombay, Limited	5	6¾—7¼	..	5 3 5
40,000	5	,,	7½	Do. New	4	5—5⅜	..	5 9 1
380,000	Stck.	14 Aug.	12½	Brentford Consolidated	100	212—217	..	5 12 11
125,000	,,	,,	9½	Do. New	100	155—160	..	5 15 7
220,000	20	11 Sept.	11½	Brighton & Hove Original	20	40—42	..	5 9 6
320,000	20	28 Mar.	11½	British	20	43—45	..	5 0 0
50,000	10	11 Sept.	11	Bromley, Ordinary 10 p. c.	10	18—20	..	5 10 0
39,000	10	,,	8	Do. 7 p. c.	10	13—14	..	5 14 3
328,750	10	13 Nov.	6	Buenos Ayres (New) Limited	10	10½—11½	−½	5 4 4
200,000	100	2 Jan.	6	Do. 6 p. c. Deb.	100	101—103	..	5 15 6
150,000	20	14 Aug.	8	Cagliari, Limited	20	26—28	..	5 14 3
550,000	Stck.	10 Oct.	13⅜	Commercial, Old Stock	100	250—254	..	5 8 3
130,000	,,	,,	10½	Do. New do.	100	198—203	..	5 5 11
130,000	,,	30 Dec.	4½	Do. 4½ p. c. Deb. do.	100	117—122	..	3 13 9
557,320	20	30 Dec.	13	Continental Union, Limited	20	47—49	..	5 6 2
242,680	20	,,	13	Do. New '69 & '72	14	32½—33½	..	5 8 5
200,000	20	,,	10	Do. 7 p. c. Perf.	20	37—39	..	5 2 6
75,000	Stck.	25 Sept.	10	Crystal Palace District	100	195—205	..	4 17 7
486,090	10	28 Jan.	4†	European, Limited	10	18½—19⅜	..	—
354,060	10	,,	4†	Do. Partly paid	7½	13—14	..	—
5,470,630	Stck.	14 Aug.	13	Gaslight & Coke, A, Ordinary	100	237—242	−8	5 7 5
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	98—101	..	3 19 3
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	251—256	..	3 18 1
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	120—125	..	4 0 0
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	177—182	..	4 2 5
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	100	164—168	..	4 3 4
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	250—255	..	3 18 5
476,000	,,	—	—	Do. K, 6 p. c. Prf.	100	150—155	..	3 17 5
1,061,150	,,	12 Dec.	4	Do. 4 p. c. Deb. Stk.	100	113—118	..	3 7 10
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	122—126	..	3 11 5
908,000	,,	,,	6	Do. 6 p. c. do	100	162—166	..	3 12 3
3,800,000	Stck.	13 Nov.	12	Imperial Continental	100	225—230	..	5 4 4
75,000	5	12 Dec.	6	Malta & Mediterranean, Ltd.	5	5—5⅛	..	5 9 1
560,000	100	1 Oct.	5	Met. of Melbourne, 5 p. c. Deb.	100	111—114	+1	4 7 9
541,920	20	27 Nov.	6½	Monte Video, Limited	20	18—19	−½	6 16 10
150,000	5	27 Nov	10	Oriental, Limited	5	8¾—9¼	..	5 8 1
60,000	5	25 Sept.	7	Ottoman, Limited	5	5—5⅛	..	5 7 3
166,870	10	16 July	4	Pará Limited	10	3—4	..	10 0 0
420,000	100	3 Nov.	6	People's Gas of Chicago—1st Mtg. Bds.	100	95—100	..	6 0 0
500,000	100	1 Dec.	16	2nd Do.	100	93—98	..	6 2 5
150,000	10	10 Oct.	10	San Paulo, Limited	10	16—17	+⅛	5 17 8
500,000	Stck.	28 Aug.	13½	South Metropolitan, A Stock	100	282—287	..	4 12 4
1,350,000	,,	,,	11⅛	Do. B do.	100	230—235	..	4 17 10
141,500	,,	,,	2	Do. C do.	100	235—245	..	4 17 11
650,000	,,	30 Dec.	5	Do. 5 p. c. Deb. Stk.	100	140—145	..	3 9 0
60,000	5	11 Sept.	11½	Tottenham & Edm'nton, Orig.	5	12—13	..	1 8 5
				WATER COMPANIES.				
729,221	Stck.	30 Dec.	10	Chelsea, Ordinary	100	269—274	+2	3 13 0
1,720,560	Stck.	10 Oct.	7½	East London, Ordinary	100	216—221	+1	3 7 10
544,440	,,	30 Dec.	4½	Do. 4½ p. c. Deb. Stk.	100	140—145	..	3 2 0
700,000	50	12 Dec.	9	Grand Junction	50	120—125	..	3 12 0
708,000	Stck.	14 Aug.	10½	Kent	100	274—279	..	3 15 3
1,043,800	100	30 Dec.	9½	Lambeth, 10 p. c. max.	100	248—253	..	3 15 1
406,200	100	,,	7½	Do. 7½ p. c. max.	100	195—200	..	3 15 0
260,000	Stck.	25 Sept.	4	Do. 4 p. c. Deb. Stk.	100	121—126	+1½	3 3 6
500,000	100	14 Aug.	12½	New River, New Shares	100	360—365	..	3 6 5
1,000,000	Stck.	28 Jan.	4	Do. 4 p. c. Deb. Stk	100	123—126*	..	3 3 6
902,300	Stck.	12 Dec.	7	S'thwk & V'xhall, rep. c. max.	100	173—180	..	3 17 9
126,500	100	,,	7	Do. 7½ p. c. do.	100	167—172	..	4 1 4
1,135,066	Stck	12 Dec.	10	West Middlesex	100	263—268	..	3 14 7

*Ex div.

† Interim dividend.

The Cost of Gas for Public Lighting at Swansea.—The Swansea Gas Company have given the Corporation notice that, on and after the 1st of April, the charge for gas supplied to the public lamps will be increased by 2d. per 1000 cubic feet; making the price 3s.

Gas, Water, and General Investment Trust, Limited.—The Directors recommend dividends at the rates of 4½ per cent. per annum on the preferred, and 10 per cent. per annum on the deferred stock for the half year ended the 28th ult.; and to place £20,132 to the reserve fund, which will now stand at £50,642.

Leicester Corporation Water-Works Engineer.—The Water Committee of the Leicester Corporation have made arrangements, owing to the rapid increase of their undertaking, for Mr. F. Griffith to devote the whole of his time as Engineer and Manager, at a salary of £500 per annum. Hitherto his duties have been divided between the flood prevention works and the water-works; half his salary being paid by each department.

Waiters' Speculations in Chicago Gas Shares.—The *Financial News* states that the waiters at Delmonico's famous New York restaurant have lost about $15,000 through speculating in Chicago gas shares. They invested their savings on the advice of a large stockholder who used to dine at the establishment. Most of them bought at about $56, when a 20-point rise was confidently predicted; instead of which the shares had a sharp fall, and the poor waiters' 5 per cent. "covers" were swiftly wiped out.

Damage to Water-Mains by Steam-Rollers.—At a meeting of the General Purposes Committee of the Folkestone Corporation last Thursday, a letter was read from the Secretary of the Folkestone Water Company, stating that the Directors wished to give the Corporation a month's notice of their intention to take County Court proceedings to recover the sum of £13 7s. 8d. expended by them in repairing mains broken and damaged by the Corporation's steam-roller, some particulars of which appeared in the JOURNAL for Nov. 4 last year. The Town Clerk said a similar account had been received before. It was resolved simply to "receive" the letter.

Strike on the Thirlmere Pipe-Track.—During the recent severe weather, the number of men engaged on the Thirlmere water-works of the Manchester Corporation was materially decreased, though many continued to work on the length of pipe-line included in Messrs. Monk and Newall's contract. It appears that the men had submitted to their pay being reduced from 5d. to 4½d. per hour; but the contractors desired a further reduction, and gave notice that the wages would be reduced to 4d. per hour. The men, rather than accept this, left their employment. The consequence is that the works in the neighbourhood of Kendal have been at a standstill during the past few days.

Accidental Extinction of Gas in North London.—An anonymous correspondent, writing to *Industries* on the 24th ult., stated that a large portion of North London had recently been plunged into darkness by the sudden failure of the gas. The incident took place about eleven o'clock at night; and the writer pointed out that as at this hour some people are asleep in bed with their gas-burners slightly on, far more serious danger was run than would be the case from a temporary extinction of glow lamps. He thought it well publicity should be given to this fact, for there was no reason why gas companies should not have their blunders exposed as well as electric light purveyors.

GWYNNE & BEALE'S PATENT GAS EXHAUSTERS AND ENGINES.

Telegrams: "GWYNNEGRAM LONDON." TELEPHONE No. 2698.

GWYNNE & CO.,

HYDRAULIC AND GAS ENGINEERS,

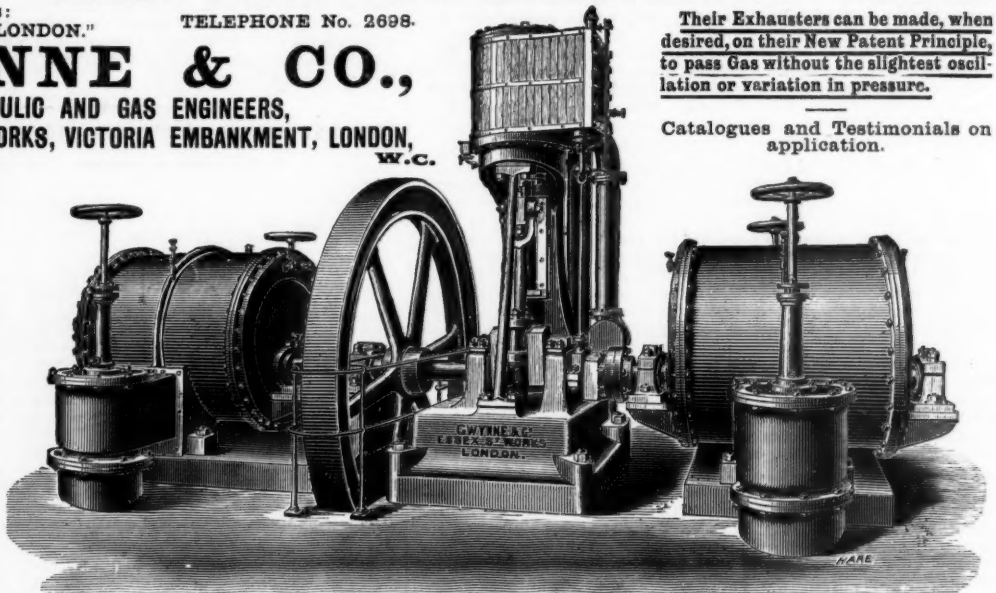
ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C.

Thirty-three Medals at all the Great International Exhibitions have been awarded to GWYNNE & Co. for Gas Exhausters, &c.

They have completed Exhausters to the extent of 29,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work.

Makers of GAS-VALVES, HYDRAULIC REGULATORS, VACUUM GOVERNORS, STEAM-PUMPS for Tar, Liquor, or Water; CENTRIFUGAL PUMPS and PUMPING ENGINES, specially adapted for Water-Works, raising Sewage, &c.

Also GIRARD and other TURBINES, HIGH-SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.



Their Exhausters can be made, when desired, on their New Patent Principle, to pass Gas without the slightest oscillation or variation in pressure.

Catalogues and Testimonials on application.

Exhausting Machinery at Fulham and Bromley Gas-Works—each set passing 400,000 cub. ft. per hour, drawing 14 miles distant from Beckton.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAY.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.

Gas Purification and Chemical Company, Limited, Palmerston Buildings, Old Broad Street, London, E.C.
JOHN WM. O'NEILL, Managing Director.

CANNEL COAL, ETC.

JOHN ROMANS & SON, EDINBURGH. Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS AND WATER WORKS.

Prices, &c., will be forwarded on application to No. 80, ST. ANDREW SQUARE, EDINBURGH, / NEWTON GRANGE, NEAR DALKEITH, } SCOTLAND.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

SULPHURIC ACID.

HUGH WALLACE & CO., Chemical Manufacturers (the old-established firm), supply the above, which is specially adapted for making White Sulphate of Ammonia. The latter purchased in any quantity at highest market prices, or contracts for the year.

For price and terms apply Botolph House, Eastcheap LONDON, E.C.

JAMES LAWRIE & CO. supply Best SCOTCH CANNEL COALS, Best FIRE-CLAY RETORTS, BRICKS, TILES, and LUMPS; BOILER SEATING BLOCKS, FLUE COVERS, and SILICA BRICKS for SPECIAL FURNACE WORK; COKE BARROWS, BOGIES, and SMALL WAGONS.

Postal Address: 1, WHITTINGTON AVENUE, E.C.
Telegram Address: "EIRWAL LONDON."

W. C. HOLMES & Co., Huddersfield, AND 80, CANNON STREET, LONDON, Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings.

*** See Advertisement p. 222 of this week's issue.

Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

J. & J. BRADDOCK, Globe Meter Works, Oldham.

First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.

Telegraphic Address: "Braddock, Oldham."

COZE'S Automatic Apparatus for CHARGING AND DISCHARGING GAS-RETORTS. For Illustrated Advertisement of this System, see p. 223.

Inquiries should be addressed to THE AUTOMATIC COAL-GAS RETORT COMPANY, LIMITED, 86-88A, LEADENHALL STREET, E.C.

TUBES.

FOR Gas, Steam, and Water; Galvanized, White Enamelled, and Hydraulic Tubes, &c.

JOHN SPENCER, Globe Tube Works, WEDNESBURY, and 14, Great St. Thomas Apostle, LONDON.

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, LEEDS, specially produce this ACID from BRIMSTONE, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

HUTCHINSON BROTHERS, Barnsley, Gas Engineers and Contractors, Makers of Wet and Dry Gas-Meters and General Gas Apparatus, Sulphate of Ammonia Plant, Lead Saturators, Tanks, &c., Tools and Sundries.

BENTLEY & CO.

MANCHESTER ELECTRICAL STORES.

FOR Batteries, Bells, Wires, and Special Electrical Apparatus, address the best house

17, NEWTON STREET, PICCADILLY, MANCHESTER.

TAR and Liquor wanted.

BROTHERTON AND CO., Commercial Buildings, LEEDS.

SADLER AND CO., LIMITED, MIDDLESBROUGH; ULVERSTON (BARROW); PORTSMOUTH; CARLTON; STOCKTON; 85, Gracechurch Street, LONDON; 70, Wellington Street, GLASGOW; 58, Fountain Street, MANCHESTER; and 96, Reade Street, NEW YORK. Tar Distillers, Manufacturers of all TAR PRODUCTS, ALIZARINE and other TAR COLOURS, BICHROMES, OXALIC ACID, ALKALIES, LIQUOR AMMONIA, AMMONIA SULPHATE, &c.
Head Office: MIDDLESBROUGH. Correspondence invited.

SHEFFIELD UNITED GASLIGHT COMPANY.

WORKS SUPERINTENDENT.

WANTED, by the Directors of this Company, an experienced and competent Man to act as SUPERINTENDENT at their Effingham Street Gas-Works. (The position is vacant owing to the present Superintendent having been promoted.) He will be required to reside on the Works, with House, Coal, and Gas free.
The maximum make of Gas at this Station is about 3½ million cubic feet per day.
Applications (marked "Superintendent"), stating age, previous engagements, and salary required, to be made by letter only, addressed to Sir Fredk. T. Mappin, Bart., M.P., Chairman of the Company, Gas Offices, Sheffield, not later than Friday, Feb. 6, 1891. Testimonials not to be sent till asked for.

HANBURY THOMAS,
General Manager.

Commercial Street, Sheffield,
Jan. 15, 1891.

WANTED, by the Sheffield United Gas Company, a competent MAN for Main and Service Laying.
Apply to the ENGINEER, stating age, experience, and wages required.

THE Sheffield United Gaslight Company require the services of an efficient DRAUGHTSMAN. One who has been connected with Gas-Works preferred.
Salary £120 per annum.
Applications (marked "Draughtsman"), stating age, previous experience, &c., to be sent to the undersigned not later han Friday, Feb. 6, 1891.

HANBURY THOMAS,
General Manager.

Commercial Street, Sheffield,
Jan. 15, 1891.

MR. ALFRED KITT, Civil Engineer, 5, VICTORIA STREET, WESTMINSTER (for 27 years with The Gaslight and Coke Company, and late Engineer of the Pimlico and Westminster Stations), having retired from the Service, is now prepared to ADVISE GAS COMPANIES on Structural Alterations, Designs for New Works, and assist in Parliamentary Proceedings. Patentee of New Inclined Retorts. Special Oil-Gas Plant.

WANTED, a Situation by the Son of a Gas Manager (aged 21), thoroughly conversant with the general working of Gas-Works, and quite competent to take charge of small Works. First-class references.
Address No. 1902, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a good practical Fitter, accustomed to Main and Service Laying, Fixing Meters, &c. One with knowledge of Blacksmith's work preferred. Applicant must be accustomed to the routine work of a Gas-Works, and make himself generally useful. Wages 25s. per week.
Apply on or before Saturday, Feb. 7, 1891, to MR. NEILL MEIKLEJOHN, Gas Engineer, Longwood, near HUDDERSFIELD.

DRAUGHTSMAN.
(TEMPORARY ENGAGEMENT.)

WANTED by the Stalybridge Corporation a DRAUGHTSMAN experienced in Gas-Works Extensions.
Address E. A. LOAM, Engineer and Manager, Gas-Works, STALYBRIDGE.

WANTED, a steady Man as Main and SERVICE LAYER, and to do the General Fitting and Smithing connected with a Gas-Works.
Apply, enclosing references, and stating age, wages required, &c., to WILLIAM HIGGS, Secretary, &c., Gas-Works Basingstoke, HANTS.

WANTED, immediately, a Combined EXHAUSTER and ENGINE, to pass about 5000 cubic feet of Gas per hour.
Address No. 1901, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, to purchase Gas Carbon delivered at nearest Station to Gas-Works, in quantities of not less than 4 tons.
Address stating price per ton and quantity, No. 1766, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, Second-hand, 4 or 3 inch STATION GOVERNOR, with Bye-Pass Valves complete.
Address C. W. GRIMWOOD, Sudbury, SUFFOLK.

ON SALE—Gas Coals and Nuts. Prompt Delivery.
Apply to the MADELEY COAL AND IRON COMPANY, LIMITED, Madeley, NORTH STAFFORDSHIRE.

GAS LAUNDRY LECTURES.

ARRANGEMENTS with Gas Companies for SPRING AND SUMMER DEMONSTRATIONS now being made. The exhibits include Greenall's Gas Washers, Davis's Gas Irons and Dryers, Glover's Gas-Ironing Machines, &c.
For terms, apply to Mrs. BURDETT, Laundry Instructress, 32, Melford Road, FOREST HILL.
NOTE.—Orders for 47 machines were obtained in two days for the Wandsworth Gas Company.

FOR SALE—34 Volumes of the "Journal OF GAS LIGHTING" (33 Bound), from January, 1874, to December, 1890. All in goodcondition.
Address No. 1900, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE—One Single Gasholder, 80 feet diameter by 20 feet deep, ten Cast-Iron Columns and Wrought-Iron Girders.
Also four PURIFIERS in a group, 16 ft. by 12 ft. by 3 ft. 9 in. deep; 12-inch Centre-Valve and Connections.
Would erect the above, and make practically equal to new.
Inquiries invited for various second-hand Gas Plant —Gasholders, Tanks, Purifiers, Washers, Exhausters, Station Meters, &c.
Apply to SAML. WHILE (late Ashmore and While), 60, Queen Victoria Street, LONDON, E.C.

TENDERS are required for Setting 43 Retorts—28 in Settings of Seven, and 15 in Settings of Five. Price at per Retort for Labour only (skilled and unskilled).
Address ARTHUR P. JAMES, 134, High Street, MERTHYR TYDFIL.

TO TAR DISTILLERS AND OTHERS.

THE Directors of the Swansea Gaslight Company are prepared to receive TENDERS for the removal and purchase of the TAR IN STOCK at their Works at Swansea; also the SURPLUS TAR produced at their Works for Twelve months from the 1st of February, 1891.
Sealed tenders to be sent in not later than Thursday, Feb. 5 next.
The Directors do not bind themselves to accept the highest or any tender.

By order,
THORNTON ANDREWS,
Secretary.

Swansea, January, 1891.

THE Sheffield United Gaslight Company invite TENDERS for the construction and fixing of a WROUGHT-IRON RECTANGULAR TUBE about 100 feet long by 6 ft. 8 in. wide and 10 in. deep.
Copy of drawing with full particulars may be obtained on payment of 10s 6d., and on application to the Company's Engineer, Mr. Fletcher W. Stevenson.
Sealed Tenders, endorsed "Tender for Wrought-Iron Tube," to be sent in to me not later than Friday, Feb. 6, 1891.
The Directors do not bind themselves to accept the lowest or any tender.

HANBURY THOMAS,
General Manager.

Commercial Street, Sheffield,
Jan. 24, 1891.

THE Sheffield United Gaslight Company invite TENDERS for a WROUGHT-IRON ROOF, 57 ft. 6 in. long by 30 ft. 6 in. span, to be delivered and fixed at their Neepsend Station.
Copy of drawing and specification may be obtained on payment of 10s. 6d., and on application to the Company's Engineer, Mr. Fletcher W. Stevenson.
Sealed tenders, endorsed "Tender for Wrought-Iron Roof," to be sent in to me not later than Friday, Feb. 6, 1891.
The Directors do not bind themselves to accept the lowest or any tender.

HANBURY THOMAS,
General Manager.

Commercial Street, Sheffield,
Jan. 24, 1891.

TO GASHOLDER MANUFACTURERS.

THE Gas Committee of the Bingley Improvement Commissioners invite First-Class Firms to TENDER for the RE-SHEETING and the IMPROVEMENT IN ITS CONSTRUCTION, of their No. 1 TELESCOPIC GASHOLDER.
Specification and form of tender to be had on application to the undersigned.
The Commissioners do not bind themselves to accept any tender.

By order,
GEORGE DUNBAR MALAM,
Engineer.

Gas-Works, Bingley,
Jan. 14, 1891.

RAMSGATE CORPORATION GAS AND WATER DEPARTMENT.

THE Committee desire Tenders for about 1348 feet of FIRE-CLAY RETORTS, 22 in. by 16 in.; also for about 96,000 FIRE-BRICKS, and 35 tons of CLAY.
Tenders to be sent in, addressed to the Chairman of the Gas and Water Committee, not later than Ten a.m. on Monday, Feb. 16, 1891, endorsed "Tender for Fire-Clay Goods."
The Committee do not bind themselves to accept the lowest or any tender.
Further particulars on application to

WILLIAM A. VALON,
Engineer.

EXTRACT from the Harrogate Gas Company's Report, dated the 5th of February, 1890: Coal consumed, 9600 tons. Gas made, 92,880,000 feet; ditto sold, 84,880,000 feet; ditto unaccounted for, 8,000,000 feet; quantity made per ton, 10,800 feet; ditto sold, 9869 feet. Illuminating Power, 16·1 candles. Coals used, Brancepeth. Owners, Strakers and Love, Newcastle-on-Tyne; who have also Brandon Hutton Seam Unscreened Gas Coal. Analysis, 10,500 cubic feet per ton; Illuminating Power, 16·2 candles.

TO GASHOLDER MAKERS.

THE Gas Committee of the Corporation of Congleton invite TENDERS for the construction and erection of a GASHOLDER.
The drawings and specification may be seen at the Gas Offices, Congleton, and at the Office of Mr. Thomas Newbigging, C.E., 5, Norfolk Street, Manchester.
Copies of the bill of quantities and form of tender may be obtained from the latter on deposit of Two Guineas, which will be returned on receipt of a *bona fide* tender.
Sealed tenders, endorsed "Gasholder, Contract No. 2," to be addressed to me, and sent so as to reach me not later than Twelve o'clock noon on Tuesday, the 10th of February next.
The Corporation do not bind themselves to accept the lowest or any tender.

JOHN WILSON,
Town Clerk.

Congleton, Jan. 17, 1891,

TO GAS APPARATUS MAKERS.

THE Gas Committee of the Corporation of Congleton invite TENDERS for the construction and erection of a TOWER SCRUBBER.
The drawings and specification may be seen at the Gas Offices, Congleton, and at the Office of Mr. Thomas Newbigging, C.E., 5, Norfolk Street, Manchester.
Copies of the bill of quantities and form of tender may be obtained from the latter on deposit of Two Guineas, which will be returned on receipt of a *bona fide* tender.
Sealed tenders, endorsed "Tower Scrubber, Contrac No. 3," to be addressed to me, and sent so as to reach me not later than Twelve o'clock noon on Tuesday, the 10th of February next.
The Corporation do not bind themselves to accept the lowest or any tender.

JOHN WILSON,
Town Clerk.

Congleton, Jan. 17, 1891.

GUILDFORD GASLIGHT AND COKE COMPANY.

TENDERS FOR RETORTS.

THE Directors of the above Company are prepared to receive TENDERS for the erection of SIX SETTINGS OF SIX RETORTS at their Guildford Works, inclusive of all Brickwork, Ironwork, Labour, and Material required in the completion of the same; also the Ascension-Pipes. Hydraulic Main, and the Coupling up to present Foul Main.
Further required information on application to Mr. Lloyd, the Gas-Works Manager.
Tenders, accompanied by plans and specifications, and endorsed "Retorts," to be sent to the Chairman of the Gas Company, Guildford, on or before Saturday, the 7th of February, 1891.

By order,
WILLIAM LONGWORTH,
Secretary.

Gas Offices, Guildford,
Jan. 22, 1891.

THE Corporation of Middleton are prepared to receive TENDERS for the following Articles required at the Gas-Works during the ensuing year: WET AND DRY GAS-METERS, GAS and STEAM TUBES and FITTINGS, RETORTS, FIRE-BRICKS, and FIRE-CLAY.
The Retorts to be delivered at the Middleton Railway Station; and the other Articles at the Gas-Works, Middleton (free of carriage).
Tenders, addressed to the Chairman of the Gas Committee, to be delivered at my Office on or before Wednesday, the 18th day of February, 1891, endorsed "Tender for Meters," "Tubes," or "Retorts," as the case may be.
Further particulars may be obtained from Mr. Duxbury, Gas Manager.
The Corporation do not bind themselves to accept the lowest or any tender.

FREDERICK ENTWISTLE,
Town Clerk.

Town Hall, Middleton,
near Manchester, Jan. 16, 1891.

HARTLEPOOL GAS AND WATER COMPANY.

TO CONTRACTORS, ETC.

THE Directors of the above Company are prepared to receive TENDERS for the several Works and Materials required in the construction of a GASHOLDER TANK, 152 ft. 6 in. in diameter, and 30 ft. 6 in. deep, in Puddle Concrete, Brickwork, and Masonry, and the Erection and Completion of the same on their Land at West Hartlepool.
Plans and Specification may be seen, or any further information obtained, on application to the Company's Engineer, Mr. Thomas Bower, who, if desired, will supply copies of the plans.
Tenders on form prescribed, and sealed and endorsed "Tender for Gasholder Tank," to be sent to Mr. Thomas Trewhitt, Secretary, Gas and Water Company, West Hartlepool, not later than Wednesday, the 11th day of February next.
The Directors do not bind themselves to accept the lowest or any tender.

By order of the Directors,
THOMAS TREWHITT,
Secretary.

Gas and Water Company's Offices,
West Hartlepool, Jan. 10, 1891.

OLDBURY LOCAL BOARD OF HEALTH.
(GAS DEPARTMENT.)

THE Gas Committee are prepared to receive TENDERS for the supply and erection of one PURIFIER, 15 feet square, with three 15-inch Valves and 15-inch Connections, including Bye-Pass.

Further particulars from the undersigned, to whom tenders must be sent, endorsed "Purifier," on or before the 15th inst.

By order,
C. MEIKLEJOHN, Engineer.

Jan. 31, 1891.

TO RETORT MANUFACTURERS.

THE Local Board, Atherton, near Manchester, invite TENDERS for RETORTS.

Copies of the specification may be obtained from Mr. Thomas Newbigging, C.E., 5, Norfolk Street, Manchester.

Sealed tenders, endorsed, "Tender for Retorts-Contract No. 6." to be forwarded so as to reach me not later than Twelve noon on Tuesday, the 24th of February prox.

The lowest or any tender not necessarily accepted.

D. SCHOFIELD,
Clerk.

Local Board Offices, Atherton,
Jan. 30, 1891.

THE Gas Committee of the Leeds Corporation solicit TENDERS for the supply of FIRE-CLAY RETORTS, FIRE-BRICKS, LUMPS, and FIRE-CLAY.

Particulars as to quantity, together with forms of tender, may be obtained from Mr. Lupton, Gas Department, Municipal Offices, Leeds.

Tenders, addressed to the Chairman at the above address, and endorsed "Tender for Fire Goods," will be received not later than Wednesday, the 18th of February next.

The lowest or any tender will not necessarily be accepted.

THE Gas Committee of the Leeds Corporation are prepared to receive TENDERS for the supply of WET AND DRY GAS-METERS, to be delivered at their Gas-Works during a period of Twelve months from receipt of order.

Each party tendering is required to send, on or before Thursday, the 12th of February next, two sample Three-Light Meters (one of which is to be unscrewed for examination), and also list of guaranteed weights of Drums, of all sizes, addressed to Mr. Lupton, Gas-Meter Works, Dewsbury Road, Leeds, from whom forms of tender may be obtained, on application at the Offices of the Gas Department, Municipal Buildings, Leeds.

Endorsed tenders, addressed to the Chairman of the Gas Committee at the latter address, will be received not later than Wednesday, the 18th of February next.

The Committee do not bind themselves to accept the lowest or any tender.

WANDSWORTH AND PUTNEY GASLIGHT AND COKE COMPANY.

NOTICE is hereby given that the ORDINARY GENERAL MEETING of the Proprietors of the above Company will be held at the Company's Offices, North Street, Wandsworth, on Thursday, the 26th of February next, at Five o'clock in the Evening precisely, for the purpose of the declaration of a Dividend, the election of Directors and an Auditor, and the transaction of the General Business of the Company.

The Transfer Books will be closed on and from the 18th till the 26th of February, both days inclusive.

By order,
WALTER CROMARTY,
Secretary.

Offices: North Street, Wandsworth,
Jan. 30, 1891.

SOUTH METROPOLITAN GAS COMPANY.

NOTICE is hereby given that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the Bridge House Hotel, London Bridge, in the Borough of Southwark, on Wednesday, the 18th day of February next, at Two o'clock in the afternoon precisely, to receive the Directors' Report and the Accounts of the Company for the Half Year ending the 31st of December last, to declare a Dividend, and to elect two Directors and one Auditor in the place of those retiring by rotation.

The Transfer Books will be closed from the 4th day of February until after the meeting.

By order,
FRANK BUSH, Secretary.

Offices: 709A, Old Kent Road, S.E.,
Jan. 26, 1891.

BARNET DISTRICT GAS AND WATER COMPANY.

NOTICE is hereby given that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of the above Company will be held at the Guildhall Tavern, Gresham Street, in the City of London, on Friday, the 27th day of February, 1891, at Half-past Twelve o'clock in the Afternoon precisely, to receive the Report of the Directors and the Accounts for the Half Year ended the 31st day of December last, to declare a Dividend, to elect Directors and an Auditor, to fix the remuneration of the Directors, and to transact the General Business of the Company.

The Transfer Books will be closed from the 14th to the 27th of February, both inclusive.

By order of the Board,
ALFRED LASS,
Secretary.

Offices: 30, Gracechurch Street,
London, Jan. 30, 1891.

GAS SHARES.

Forty £10 Seven per Cent. Shares in the Bromley (Kent), Gas Consumers' Company, and Twenty-seven £10 Ten per Cent. Shares in the Crays Gas Company.

MESSRS. BAXTER, PAYNE, AND LEPPER will sell by Auction at the Bell Hotel Bromley, on Thursday, Feb. 12, 1891, at Eight o'clock precisely, in Lots, the above Shares, offering a safe and well-secured Investment. The Bromley Company on the last occasion paid 8 per cent., and the Crays Company a dividend of 10 per cent.

Particulars at the place of Sale, and of BAXTER, PAYNE, AND LEPPER, Land Agents, Bromley and Beckenham, KENT, and 69, KING WILLIAM STREET, E.C.

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Printed copies of this Section, in large type, on broad sheets, may be obtained of WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

*** *The Act extends to Scotland and Ireland.*

MR. W. H. BENNETT having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their Inventions may be secured for Twelve months; or LETTERS PATENT, which are granted for Fourteen Years.

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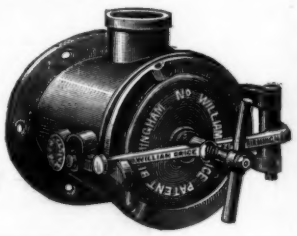

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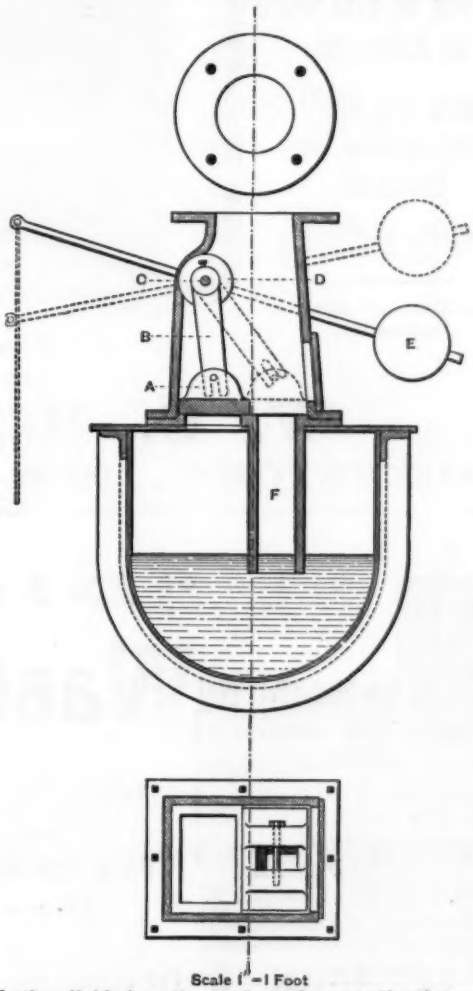

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Is perfectly reliable in action, and requires no attention.
Has all the advantages of the Dip and Anti-Dip combined.
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Will more than save their cost in one season's working.

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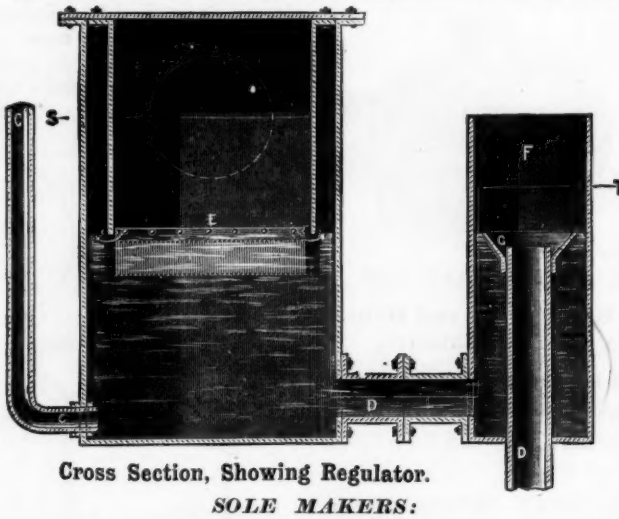
(As described in the JOURNAL OF GAS LIGHTING for Sept. 2, 1890.)

The only Washer without moving parts that can be fixed before an Exhauster.

No more Gas spoilt by over-running the Exhauster.

Perfectly Self-acting.

Particulars and prices on application.



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The only safe arrangement to work without Dip.

Less wear and tear on the Exhauster.

No moving parts.

Occupies small space.

State maximum make of Gas per diem.

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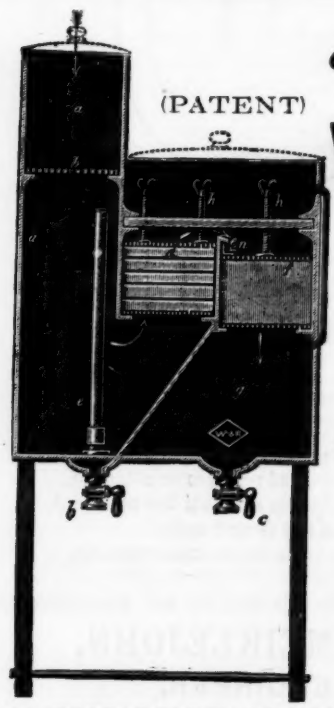

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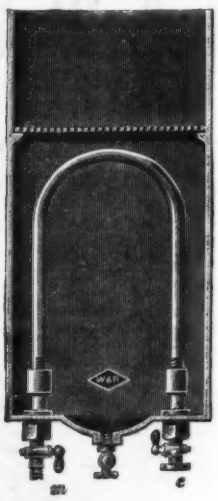

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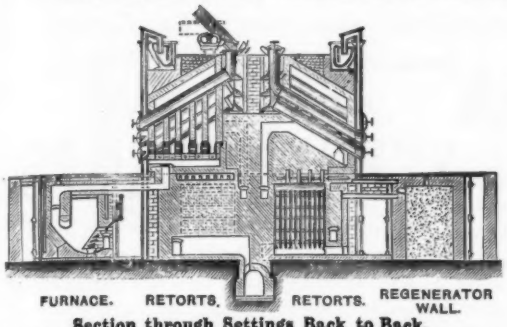
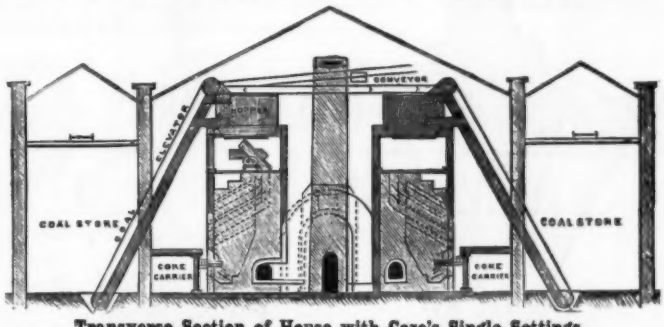
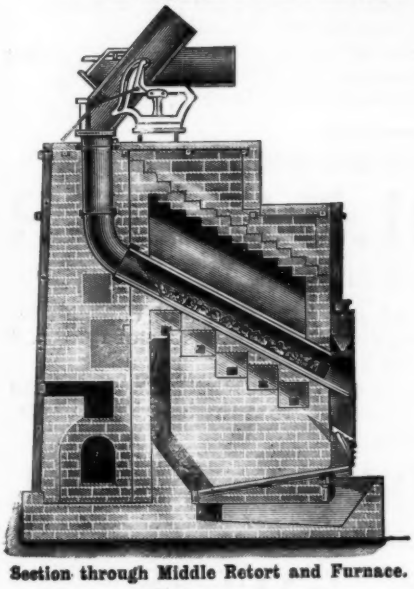


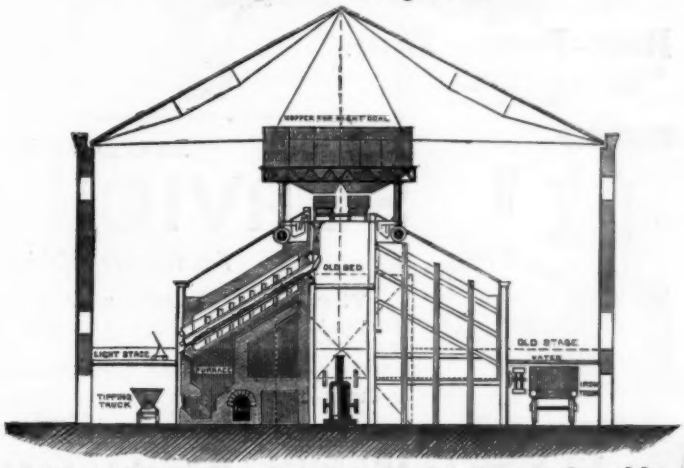
Section through Settings Back to Back.
Working off ground floor with Generator under Stage and Regenerator under the Sets.



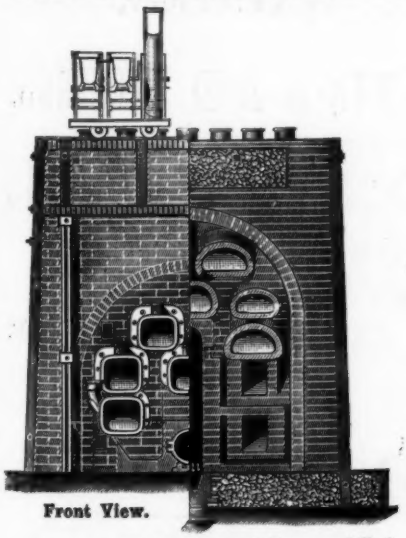
Transverse Section of House with Coze's Single Settings, Showing Method of working Two Single Settings and Distributing the Coal to the Supply Hoppers; the whole of the work being Automatic. This plan is for a large House.



Section through Middle Retort and Furnace.

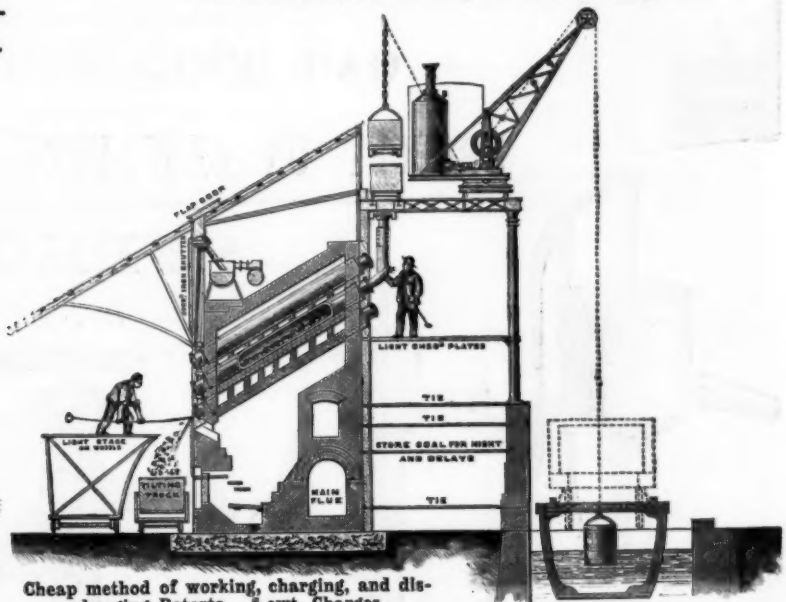


Section of old Retort-House converted, Two Sets 20 fts. in place of One. Modified form, with ordinary Retorts and Fittings.



Front View.

Section through Furnace & Bed.



Cheap method of working, charging, and discharging Retorts. 5-cwt. Charges.
Section through Setting, Front to Back. Coal Barge or Railway.
Light Corrugated Roof over Sets and at Sides.

These Systems are fully Patented, and any Infringer will be strictly proceeded against.

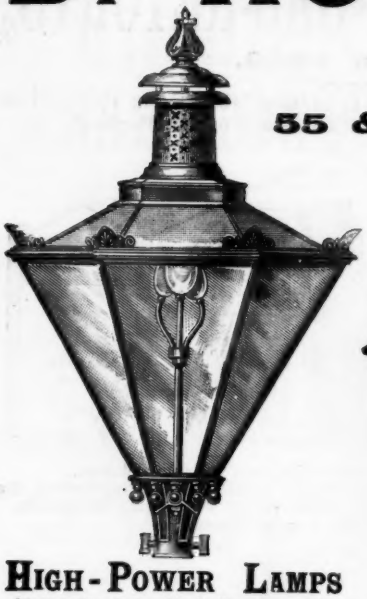
For further particulars apply to W. M. KIGHT, Secretary of THE AUTOMATIC COAL-GAS RETORT COMPANY, LIMITED, 86 and 38A, LEADENHALL STREET, LONDON, E.C.

D. HULETT & CO., LTD.,

GAS ENGINEERS,

55 & 56, HIGH HOLBORN, LONDON,

Manufacturers of every description of Gas-Fittings.



HIGH-POWER LAMPS

Of every description, fitted with Copper Tops, Porcelain Cones, and Regulating High-Power Burners.

HULETT'S PATENT

STREET LAMPS.

No putty required.
Glass secured by hinged clips. No loose parts.
A new pane of glass can be fitted in a few minutes by any inexperienced person.
Glass can be supplied cut ready for use.
The frames are not liable to be damaged as in ordinary lamps when hacking out a broken pane of glass.
The glass can be removed for repainting.
Several thousands of these are now in use, giving general satisfaction.
They are strongly made, and of the best material.

HULETT'S IMPROVED

SERVICE CLEANSER

For Removal of Obstructions in Gas Service Pipes.

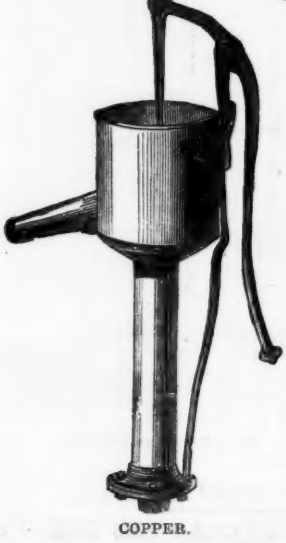
They are constructed with Air Vessels of great strength and capacity for storing a large quantity of air, which can be delivered at a pressure of 150 lbs. if necessary.

They are also fitted with Water Fittings, so that about a gallon of liquid can be discharged with the air, for removing Naphthalene from the interior of tubes.

WET AND DRY GAS-METERS.

GAS PRESSURE GAUGES.

WROUGHT OR CAST IRON TUBES AND FITTINGS.

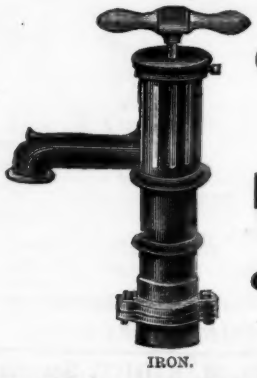


COPPER.

BRASS.

SYPHON PUMPS,

In Iron, Brass, and Copper.



IRON.

CAST-IRON SYPHONS FOR MAINS.

LAMP-POSTS.

CRADLES AND BRACKETS.

— PRICE LISTS UPON APPLICATION. —

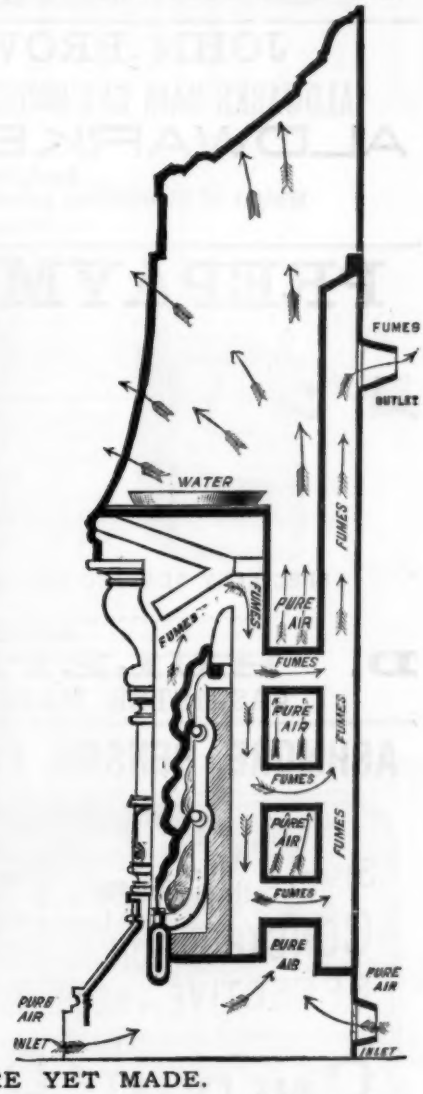
ONLY GOLD MEDAL Food and Cookery Exhibition, 1890.

H. DARWIN & CO., LIMITED,

GAS FIRE AND STOVE MANUFACTURERS.

THE "DARWIN"

CALORIC GAS-FIRE.



NEAREST APPROACH TO A COAL FIRE YET MADE.

Elegant in Design. **PATENT FIRE.** *Silent Jet.*

PRICES.	No. 1.	No. 2.	No. 3.
Best black finished	£2 5 0	£2 15 0	£3 5 0
Best Berlin black finish	2 15 0	3 7 0	4 0 0
Top Panels Electro Nickelled, Brassed, or Copper Bronzed	2 15 0	3 7 0	4 0 0
Top Panels and Sides do.	3 3 0	3 15 0	4 8 0
Stove all do.	3 10 0	4 5 0	5 0 0

With Hand-Painted Tiles, 10s. to 20s. extra.

ST. ANDREW'S WORKS, 618 to 622, EGLINTON STREET, GLASGOW.

"THE METEOR."

NEW HIGH-POWER GAS-LAMP.

Westphal's Patent.

Gas Companies should hire these Lamps to their Consumers, and introduce them for Street Lighting as a rival to the Electric Light, as they do not get out of order, are most economical, and the Burner being a circular slit does not choke up.

Particulars and Prices Free.

HENRY GREENE & SONS,

SOLE CONSIGNEES FOR GREAT BRITAIN & COLONIES

153 TO 155, CANNON STREET,
LONDON BRIDGE, E.C.

TELEGRAPHIC ADDRESS, "GAS LEEDS."

LONDON OFFICE, 60, QUEEN VICTORIA STREET, E.C.

CLAYTON, SON, & Co.

LIMITED,

LEEDS,

MAKE

RETORT LIDS

OF ALL FORMS AND SHAPES
IN IRON OR STEEL
BY SPECIAL HYDRAULIC
MACHINERY.

PRICES ON APPLICATION.

JOHN BROWN & CO., LTD., SHEFFIELD,

Proprietors of

ALDWARKE MAIN CAR HOUSE & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.

ALDWARKE MAIN GAS COAL

Analysis: 12,600 feet of 19-candle gas per ton.
Weight of illuminating power in pounds of sperm, 820·80. Very free from impurities.
Telegrams: "ATLAS SHEFFIELD."

PREPAYMENT GAS-METER.

(PRICE'S PATENT).

This Meter has a simple Automatic arrangement fitted, whereby, upon the insertion of a shilling, a supply of gas can be obtained, and which is cut off on the quantity paid for being consumed. The Meter gives warning when the quantity is nearly exhausted, so that another shilling may be inserted. There is, however, no occasion to wait until this happens, as a second shilling can be inserted after two-pennyworth of the first shilling has been consumed.

The Meter is fitted with the ordinary registering dial, and has in addition a circular one divided showing twelve pence. On each Meter is marked the number of cubic feet it will pass for one shilling; and this can be arranged to cover cost of Meter-Rental, Fitting, and Gas consumed. These Meters are made of the best material and workmanship.

SPECIALLY ADAPTED FOR INCREASING CONSUMPTION AMONGST SMALL CONSUMERS.
NO RISK OF BAD DEBTS.

PROPRIETORS AND MANUFACTURERS:

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GAS-METER MAKERS, 55 & 56, HIGH HOLBORN, LONDON.

ASHMORE, BENSON, PEASE, & CO., LTD., STOCKTON-ON-TEES.

TELEGRAMS
Gasholder
MAKERS OF LARGEST GAS HOLDER IN THE WORLD
STOCKTON-ON-TEES
ASHMORE BENSON PEASE & Co
SIMPLE IN CONSTRUCTION
EFFECTIVE IN RESULTS
SULPHATE PLANT
DAVIS PATENT
ECONOMICAL IN COST & SPACE
STILLS IN 2 3 & 4 FLATS
MAKERS OF
ALL GAS PLANT &
Every kind of Constructional Ironwork
OIL GAS PLANT FOR WORKS VILLAGES & MANSIONS
PEASE'S Patent WIRE ROPE SYSTEM
for Guiding Gasholders. Effecting a Saving of 25 per cent in Cost

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SOLE AGENTS FOR THE CELEBRATED

BRECKENRIDGE CANNEL

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OLD KENTUCKY BOGHEAD

OF KENTUCKY, U.S.A.

These Cannels will rank with the Australian Shale for Gas Manufacture.

Also General Sales Agents for

PENNSYLVANIA & VIRGINIA GAS COALS, & AMERICAN FOUNDRY & FURNACE COKE.

Delivery Prices made to any Port in

GREAT BRITAIN, ON THE CONTINENT, OR SOUTH AMERICA.

Full Information furnished upon Application to the above Address.

CHEAP STEAM — FOR — GAS-WORKS.

MASON'S PATENT FURNACE

Can be applied to any kind of Boiler.

It improves the draught.

Economises time in raising steam.

Gives steam quickly at any pressure.

THE ONLY FUEL recommended is

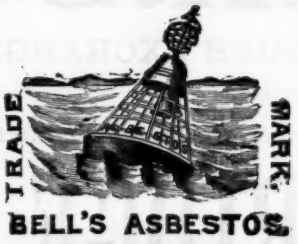
COKE DUST,
COAL DUST,
CINDERS,
SAWDUST,
BREEZE,

Or any other Refuse Fuel.

W. F. MASON,

ENGINEER and PATENTEE,
Longsight, MANCHESTER.

BELL'S ASBESTOS

AQUOL  PAINT

IS MADE READY FOR USE.

IS FIRE RESISTING.
IS WASHABLE.
IS NON-POISONOUS.
IS MANUFACTURED IN ALL USEFUL COLOURS.
IS IMPERVIOUS TO HEAT, COLD, OR WATER.
IS WITHOUT SMELL.

No expensive Oil or Turpentine required.

WILL NEVER BLISTER.

HAS A COVERING CAPACITY 40 PER CENT. GREATER THAN LEAD PAINTS.

For Outside or Inside Work in any Climate.

Bell's Asbestos Aquol Paint is equally suitable for the finest decorative work as well as for general painting. It can be applied over or under any other paint, and, owing to its easy application, can be used with a large distemper brush; the SAVING THUS EFFECTED IN LABOUR BEING **50** PER CENT. OVER THAT OF LEAD PAINTS.

Bell's Asbestos Aquol Paint is susceptible of the most delicate treatment; and, owing to its perfect flatted surface, it brings up the varnish in a manner that no other paint can equal. ONE COAT OF VARNISH ON **Bell's Asbestos Aquol** IS EQUAL TO TWO COATS ON ORDINARY PAINT.

BELL'S ASBESTOS AQUOL PAINT is specially adapted for Private Houses, Exhibition Buildings, Ships, Churches, Asylums, School Boards, Railway Stations, and all work of Wood, Iron, Cement, Plaster, Stone, Brick, &c., &c.

Those who Study Economy and Protection from Fire should use only

BELL'S ASBESTOS AQUOL PAINT.

BELL'S ASBESTOS AQUOL PRIMING is made Ready for Use.
BELL'S ASBESTOS AQUOL PRIMING stops all suction of Wood, Cement, Plaster, &c.
BELL'S ASBESTOS AQUOL PRIMING should be applied to all New Work.

Suitable for Ceilings, Walls, and New Wood, and is very durable.

BELL'S ASBESTOS AQUOL KNOTTING, for Stopping Knots in New Work.

AN EXCELLENT CURE FOR DAMP WALLS.

Colour Cards and Price Lists on Application.

Supplied in Casks of 5 to 7 cwt., and Iron Drums of 28, 56, and 112 lbs., Sample Tins of 7 and 14 lbs.

Owing to its Covering Capacity, a SAVING IN FREIGHT of 40 per cent. is effected for a given surface.

BELL'S ASBESTOS COMPANY, LIMITED,

SOUTHWARK, LONDON, S.E.

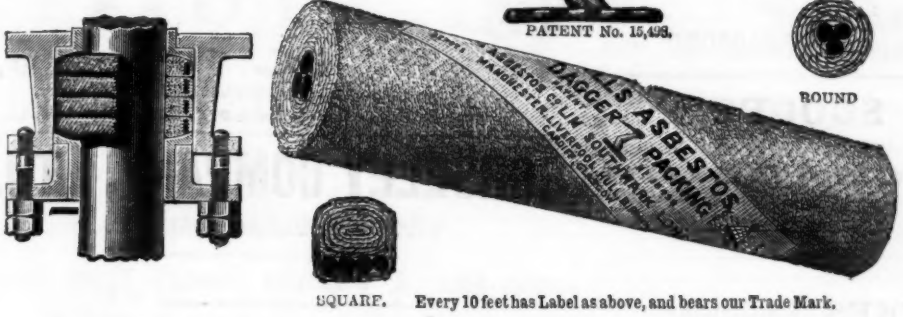
DEPOTS—MANCHESTER: Cable Street, Blackfriars. **LIVERPOOL:** 2, Strand Street, James Street. **HULL:** Humber Dock Basin. **GLASGOW:** 35, Robertson Street. **DUBLIN:** 2, St. Andrew Street. **BERLIN, BARCELONA, and ANTWERP.**

AGENTS—BIRMINGHAM: BELL and Co., 7, John Bright Street. **BRISTOL:** ROBERT STOTESBURY, 114, Redcliff Street. **CARDIFF:** BELL and Co., West Bute Street.

BELL'S ASBESTOS DAGGER

PACKING

PATENT No. 15,493.



ROUND

SQUARE. Every 10 feet has Label as above, and bears our Trade Mark.

Under this registered title are included the inventions of Mr. Field; and experience has proved them to be the MOST EFFICIENT DURABLE, and ECONOMICAL PACKINGS ever made. They constitute such a combination of Asbestos and India-rubber as secures the maximum of elasticity and heat resistance; and they are, therefore, UNEQUALLED FOR EVERY KIND OF ENGINE. These Packings are being universally used by most of the leading Steamship Companies throughout the world for ordinary Compound, Triple, and Quadruple Expansion Engines of the latest types. The packings are composed of rolled Asbestos Cloth, but the India-rubber is placed in two forms to suit various cases.

IN ORDERING STATE WHETHER SQUARE OR ROUND IS REQUIRED.

BELL'S ASBESTOS CO., Ld.

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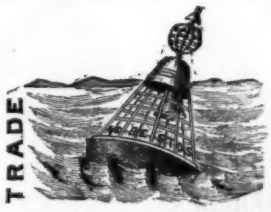
LIVERPOOL: 2, Strand St., James St.
HULL: Humber Dock Basin.
GLASGOW: 35, Robertson Street.
DUBLIN, BERLIN.



DEPÔTS.
BARCELONA, and ANTWERP.

AGENTS.
BIRMINGHAM: BELL and Co., 7, John Bright Street.
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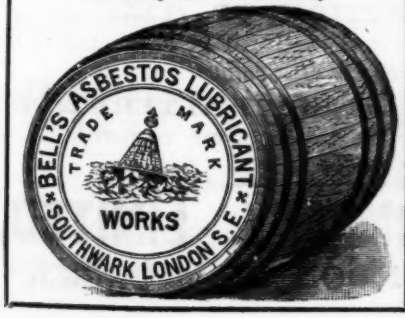
SOUTHWARK, BELL'S ASBESTOS. LONDON, S.E.

BELL'S ASBESTOS
YARN AND SOAPSTONE PACKING
BEST LOCOMOTIVE PACKING made.

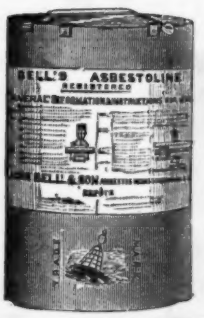
BELL'S
COMPOUND HYDRAULIC PACKING
Is specially suited for
Hydraulic Machinery, Accumulators and Ammonia and all Pumps.

BELL'S ASBESTOS LUBRICANT
Is unequalled
For Steam-Engines & Cylinders, Gas-Engines, and every class of machinery.



BELL'S ASBESTOLINE
The reputation of this Lubricant is based on the experience of thousands of users, which places it far in advance of those who rely only on mere laboratory tests.

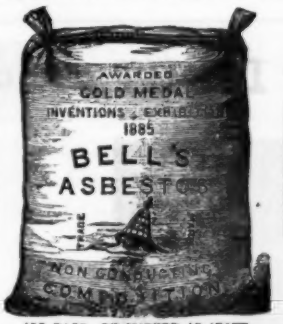
ASBESTOLINE IS THE CHEAPEST MOST EFFICIENT, CLEANEST MOST INODOROUS AND SAFEST LUBRIGANT.



ASBESTOLINE HAS SAVED 60 PER CENT. OVER OIL.
Has been used for all purposes, AND BEATEN ALL OTHER LUBRICANTS IN ACTUAL WORK.

BELL'S ASBESTOS
EXPANSION SHEETING
RINGS, AND TAPE.
Is the most efficient and reliable Material for Manhole, Mudhole, Steam-Pipe, and all other Joints.

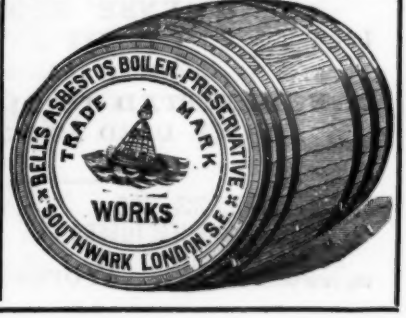
BELL'S ASBESTOS
NON-CONDUCTING COMPOSITION.
Will reduce loss by radiation and saves 40 per cent. of fuel.
Is superior to any other, and saves its cost in a few months.



Can be applied again after many years' service. Is sent out dry in bags; therefore cheaper than others sent out wet.

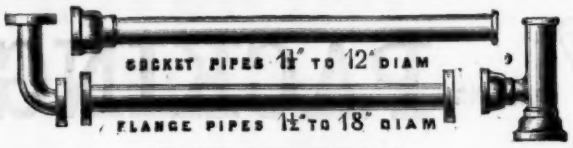
ALL BAGS BE MARKED AS ABOVE.

BELL'S ASBESTOS
BOILER PRESERVATIVE
Will effectually keep Boilers clean, and remove any Incrustation, without injury to the Boiler, Plates, or Fittings.



CAST-IRON PIPES.

Castings of all kinds for Engineers, Gas and Water Works, &c.



Irregular Pipes of all kinds.

E. & W. H. HALEY, IRONFOUNDERS, BRADFORD, YORKS.

STEEL SCOOPS
FOR
RETORT CHARGING.

Scoops supplied with or without handles, and of any dimensions or shape required.

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JONAS DRAKE & SON.

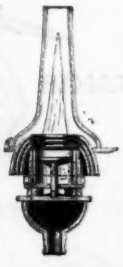
—GAS— —ENGINEERS— —CONTRACTORS— —IRONFOUNDERS— —RETORT SETTERS— —ETC.—

Specialities in CARBONIZING PLANT.
GENERATOR AND REGENERATOR FURNACES.

OVENDEN,
HALIFAX (YORKS.)

THE NEW "DOUGLASS" PATENT GAS-BURNERS

(Sir Jas. N. Douglass's Patents).



Burners upon the "Douglass" principle are now on the mark for ordinary purposes as used by the Government and at the following Lighthouses: The Eddystone; Dungeness; Whitby; Scilly Rock; and many others.

GIVE A PURE WHITE AND BRILLIANT FLAME.
Without Smoke or Chimney Breakage.
CONSUME LESS GAS, and give a more POWERFUL LIGHT than any other Burner yet devised.
SIZES FROM 15 TO 3000 CANDLE POWER.

All particulars can be obtained from

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Agent for the "DOUGLASS" Gas & Oil Burners,
57, Chancery Lane, W.C.

HORSELEY COMPANY, LTD.

TIPTON, STAFFORDSHIRE.

London Office: 6, Westminster Chambers, Victoria Street.

GAS ENGINEERS, IRONFOUNDERS, &c.,
Manufacturers of
GASHOLDERS,
AND ALL KINDS OF GAS AND WATER WORKS PLANT.

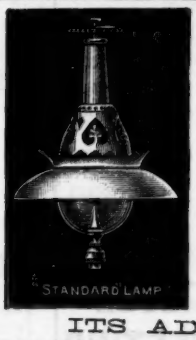
Gas-Bags for Mains. High-Water Boots. Woollen Miners' Jackets.

Delivery and Suction Hose, Gutta-Percha Acid Bottles, Leather Driving Bands, Woven Canvas Hose for Fire-Engines, Wedge and Square Gas-Bags, Air and Water Beds for Invalids, Oil Tarpaulin Coats, Trousers, Hats, &c., Squeegees for cleansing Pavements, &c., Billiard and Bagatelle Cush, Tricycle Tyres, Leather Hose, Cotton Waste, Engine Cloths, Oils, &c., India-rubber Waterproof Garments for Walking, Driving, or Sporting Wear, Diving and Wading Dresses, Printers' Blankets, Iron Wheels and Rollers covered with India-rubber, and Stokers' Gloves.

Write for Price List to

THOMAS BUGDEN, Manufacturer,
116 & 118, GOSWELL ROAD, LONDON, E.C.

"LIGHT, Wenham Gas Lamps MORE LIGHT."



ITS ADVANTAGES ARE:

IMMENSE ECONOMY IN THE CONSUMPTION OF GAS.
INTENSITY, PURITY, AND STEADINESS OF THE LIGHT.
Absence of Downward Shadow. Practical Completeness of Combustion.
CAN BE FITTED TO ORDINARY SUPPLY-PIPES WITHOUT ALTERATION.
CAN BE USED AS VENTILATING LIGHTS, whereby the products are removed, and damage to decorations, &c., prevented.

SOLE PROPRIETORS AND MANUFACTURERS: **THE WENHAM COMPANY, LIMITED,**

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RETORT SETTINGS IMPROVED

BY ADOPTING

THE "NUGENT" & "ROBUS" SETTINGS.

ECONOMY WITH DURABILITY GUARANTEED.

HUNDREDS OF SETTINGS WORKING EMINENTLY SATISFACTORY.

Estimates and Particulars for every Description of Retort Extensions and other Work.

J. & H. ROBUS,

CONTRACTORS FOR GAS AND WATER WORKS,

20, BUCKLERSBURY, LONDON, E.C.

Two Thousand Boilers kept Clean

By using "CROSBIE'S COMPOSITION," which is absolutely harmless, and the most economical means of preventing Incrustation obtainable. Testimonials on application. Price in casks, 18s. 6d. per cwt., delivered free. Used at the following Gas-Works: Ascot, Birmingham, Broadstairs, Bromsgrove, Hendon, Leven, N.B., Pembroke, Seaham Harbour, Stamford, Warwick, &c., &c., and by leading Engineers throughout the Country.

ADOLPHE CROSBIE, Walsall Street Chemical Works,

WOLVERHAMPTON.

GEORGE ORME & Co., Atlas Meter Works, OLDHAM.

Manufacturers of

IMPROVED WET AND DRY GAS-METERS, in Cast-Iron and Tin-Plate Cases.

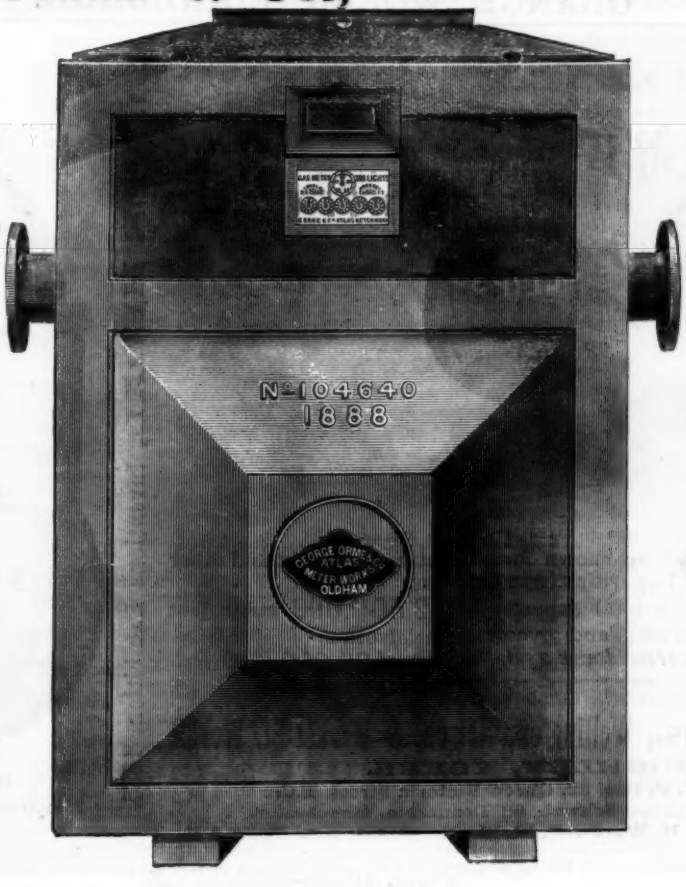
LAMP METERS.

PRESSURE GAUGES.

IMPROVED STREET LANTERNS of New Designs.

LAMP TORCHES.

GAS, WATER, AND STEAM FITTINGS of all kinds.



ORME'S GAS REGULATOR (BEHL'S PATENT) for Street Lamps.

Over 150,000 now in use.

Adopted by the Leading Gas Companies and Corporations.

ORME'S GAS REGULATOR (BEHL'S PATENT) for Domestic Use.

COLE'S PATENT SUSPENSION REGULATOR for Regenerative Lamps, &c.

Illustrated Price Lists upon application.

Telegraphic Address: "ORME OLDHAM." Telephone No. 93, OLDHAM.

GAS COAL.

BEST
REAL OLD SILKSTONE GAS COAL.
Address, THE STRAFFORD COLLIERIES COMPANY,
Near BARNSLEY, SOUTH YORKSHIRE.

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Illustrated Pamphlet and Terms on application to J. E. FISHER, Stourbridge, Agent for England and Wales; to C. M. HAMILTON, Portland Place, Hamilton, Agent for Scotland and Ireland; and for all other Countries to the Patentee,

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Results of Tests of Dry Gas-Meters (Section III.) of the Glasgow Philosophical Society's Gas Exhibition, as per London "Gas Journal," May 10, 1881.

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Total of Fast Tests . .	47·2 ...	6·9 ...	33·6 ...	62·3 ...	53·7
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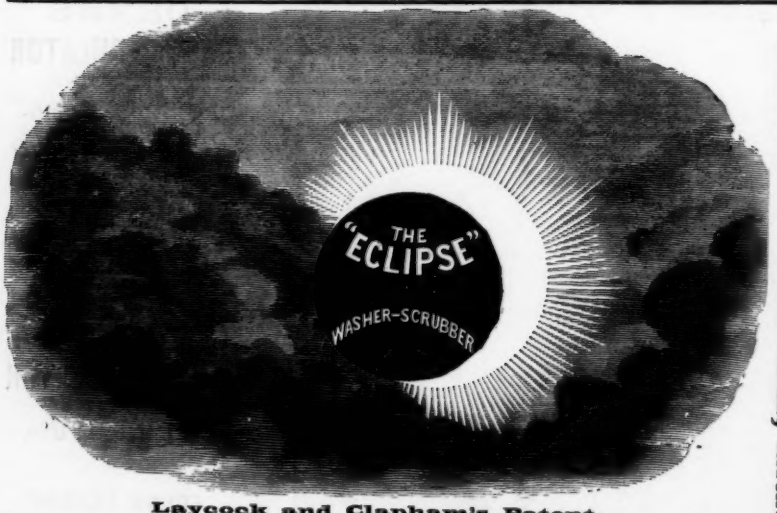

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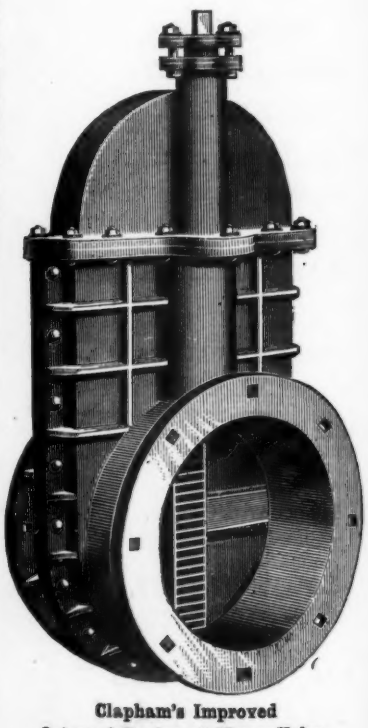
SILVER MEDAL, Inventions Exhibition, 1885.



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